

YELLOWSTONE SCIENCE

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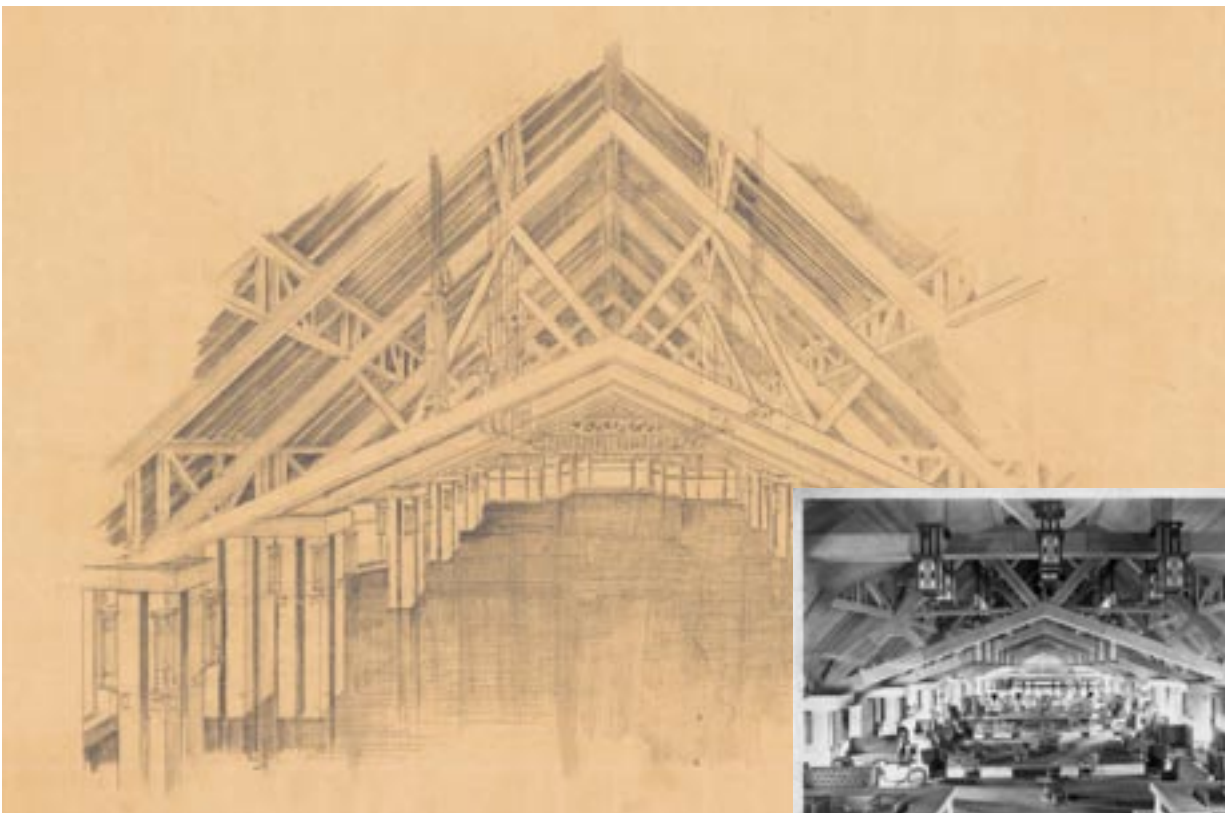


Yellowstone and Art

Supervolcano and the Media

Grand Canyon Hotel

Elk Calf Mortality



Sketch of the Canyon Hotel lounge, presumably by Robert C. Reamer.



YNP PHOTO ARCHIVES, YELL. #88972

Haynes photograph of the lounge, circa 1920.

Isn't it Grand

“If the Grand Cañon of the Yellowstone is one of the crowning works of Nature, so is the Grand Cañon Hotel, set out here many long miles from railway transportation, one of the crowning works of man.”

—Gerrit Fort, *The Grand Cañon of the Yellowstone*, 1912

IT'S NOT TO SAY that “they just don't make 'em like they used to,” but something about reading Tamsen Hert's article on the Grand Canyon Hotel makes me sad that this building is no longer around for us to experience, regardless of its structural deficiencies. This lodge, designed by architect Robert Reamer, held an aesthetic appeal. It was about arriving at a destination, a “luxury in the wilderness.” Today's park managers continue to struggle with issues of whether to tear down historic structures or continue to commit the expenses necessary to maintain them. These are complex choices, driven by considerations that include nostalgia and cultural value as well as federal policy and financial implications.

More than an architectural rendering, the sketch of the Canyon Hotel Lounge shown above is a work of art in and of itself, although artists have more often found inspiration in the park's natural wonders. In this issue of *Yellowstone Science*, Peter Hassrick explores the role of artists in the creation of Yellowstone as the world's first national park. He gives us a glimpse of a few of the amazing pieces that were inspired

by the eccentricities of this Wonderland, and places them in the context of art and conservation history. At the time of the park's creation, artworks were a way to bring the park to people far away, and to encourage tourists to make the trip to see the park in person.

In contrast, Jake Lowenstern's article on the Yellowstone supervolcano discusses the fear some foster of visiting the park today. He considers the responsibilities of the media and scientists in educating the public about one of the park's more dramatic natural processes—volcanism. His article addresses the question, What risks are reasonable to assume on a visit to the park?

In this issue, we also try to shed a bit of light on another hotly debated question—are wolves responsible for the low recruitment currently documented in the elk population? Or are there other explanations?

We hope you enjoy the issue, and revel a bit in some of the beautiful work and illuminating research that this park has and will continue to inspire.

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a quarterly devoted to
natural and cultural resources

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on the cover:

Thomas Moran, *The Grand Cañon of the Yellowstone, 1872.*

U.S. Department of the Interior
Museum, Washington, D.C.



NPS/DANIEL STAHLER

A post-wolf restoration elk calf mortality study is almost complete. Are bears or wolves taking more calves?

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NEWS & NOTES

Heritage and Research Center Opens to the Public

The Heritage and Research Center opened its doors on May 18, 2005, and is open during regular working hours, Monday–Friday, 8:00 AM to 5:00 PM. Housed there are a research library, museum collection, and archives, as well as the park’s herbarium and archeology lab.

The library is open Tuesday–Friday, 9:00 AM to 4:00 PM. The archives and museum collection are available to researchers by appointment only. Appointments must be made at least 24 hours in advance by calling the main number, (307) 344-2664. The library may also be reached via this number.

Aubrey Haines’s Yellowstone Collection Donated to Montana State University

Most of former Yellowstone National Park historian Aubrey L. Haines’s collection of historical documents and memorabilia has been donated to Montana State University and will soon be available to researchers and students. Mr. Haines, the park’s first historian from 1959–1969, spent decades researching, collecting, and writing the park’s definitive two-volume history, *The Yellowstone Story*, as well as several other books on Yellowstone and other national parks. According to Yellowstone National Park writer Paul Schullery, Haines “always had time to help other writers and historians. And in that same spirit, the Haines family has given national park scholars everywhere a wonderfully generous gift.” The Haines collection will become part of MSU’s Special Collections library; it will soon be available to students and researchers.

YCR Volunteer Wins Regional Hartzog Award

On July 12, Yellowstone Center for Resources volunteer John J. Reynolds was presented with the award for the Intermountain Region’s representative for the national competition for the George B. Hartzog, Jr., Award for Outstanding Volunteer Service. Mr. Reynolds has donated over 3,693 hours to the park’s archeology program over the past six summers. His always-ready help, facilitation, and attitude have improved and increased the productivity of all those around him. Because of his assistance in the field, the amount of inventory and excavation completed was at least 20% greater than anticipated in project budgets, and larger areas of critically endangered, eroding sites (and the information they contain) were salvaged.

John’s popular articles in *Yellowstone Science* and the *Greater Yellowstone Report* (a publication of the Greater Yellowstone Coalition) have taught the public more about the importance of both archeological resources and opportunities for volunteerism in Yellowstone. Several thousand dollars have been donated to archeological projects at least in part due to his efforts, and the archeology program’s cataloging backlog has been reduced by 1,200 artifacts.

George B. Hartzog, Jr., NPS Director from 1964 to 1972, announced the new Volunteers-in-Parks program on November 17, 1970. He recognized the need to make it easier for citizens to donate, without compensation,



Superintendent Suzanne Lewis (left) and park archeologist Ann Johnson (right) congratulate volunteer John Reynolds, the NPS Intermountain Region’s representative for the national George B. Hartzog, Jr., Award competition.

their time and talents to the NPS and pushed through legislation creating the VIP program. After his retirement, he remembered the VIP program with a generous donation to the National Park Foundation. This fund is used to support non-monetary awards that honor the efforts of exceptional volunteers, groups, and park VIP programs.

Bison Movements Study Available

An independent assessment, “The Ecology of Bison Movements and Distribution in and beyond Yellowstone National Park,” has been completed and is now available to the public. Produced by Dr. Cormack Gates, an internationally recognized expert in bison ecology and management, the study included collaborative input from more than 30 scientists, biologists, and current and retired park staff, as well as 15 interested non-government organizations. The report addresses how groomed roads influence bison movements during the winter and provides management recommendations to the National Park Service to address remaining information needs. In summarizing the report, Dr. Gates concluded that “Road grooming is not the major factor influencing bison distribution and range expansion, and available evidence strongly suggests that groomed roads that align with

natural movement corridors have not changed population growth rates relative to what may have happened in the absence of road grooming.” The study does note that one short road segment through Gibbon Canyon does not align with natural movement corridors and might facilitate bison movement from the central range to the northern range. Copies of the report are available online at <www.nps.gov/yell/technical/planning/gates/index.htm>.

Boyd Evison Graduate Fellowship Awarded

Florence M. Gardipee, a Ph.D. student at the University of Montana in Missoula, became the first recipient of the Boyd Evison Graduate Fellowship on June 6, 2005. She plans to use her award to initiate a new research study on American bison in Yellowstone and Grand Teton national parks.

The Evison Fellowship was established in memory of Boyd Evison after

his death in October 2002. Evison retired in 1994 from an exemplary 42-year career with the National Park Service and soon after began a second career as executive director for the Grand Teton Natural History Association, a non-profit park partner dedicated to aiding interpretive, educational, and research programs for Grand Teton National Park.

The goal of the fellowship is to encourage scientific and conservation-related research in national parks. It invites highly motivated graduate students to conduct thesis research within the Greater Yellowstone Area (GYA), and supports study leading to a Master’s or Ph.D. degree in the biosciences, geosciences, or social sciences.

Gardipee plans to use DNA samples and data gathered from bison feces to document the genetic diversity of this herd, and subsequently discover how genetic diversity, or lack thereof, affects susceptibility to infectious diseases such as brucellosis in the parks’ wild bison

populations. If successful, this technique could be used throughout the GYA and elsewhere to increase understanding of bison population dynamics and the relationship between infectious diseases, genetic variation, and bison behavior.

To inquire about applying for a Boyd Evison Graduate Fellowship, or to donate funds toward this program, please contact Jan Lynch, Executive Director, Grand Teton Natural History Association, PO Box 170, Moose, Wyoming, 83012.

Errata

In the spring issue of *Yellowstone Science* 13(2), it was stated that in the U.S., lynx reside only in Greater Yellowstone, northwest Montana, and the Cascade Range of the Pacific Northwest. In fact, lynx have also been recently documented in a few other states, including Colorado, Maine, Minnesota, Alaska, and possibly Idaho.

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Passages — Irving Friedman

IRVING FRIEDMAN, a longtime U.S. Geological Survey (USGS) scientist and a pioneer in geochemistry, died at home in Lakewood, Colorado, on June 28, 2005, at the age of 85.

Dr. Friedman was born in New York City on January 12, 1920. He obtained a B.S. degree in chemistry from Montana State University, a M.S. degree in chemistry from Washington State University, and a Ph.D. in geochemistry at the University of Chicago. He was a member of the famed group of post-doctoral researchers in Nobel laureate Harold Urey's laboratory at the Institute for Nuclear Studies at the University of Chicago. There, Friedman built the first mass spectrometer for routine measurement of the hydrogen isotope composition of water. Dr. Friedman is called the "father of isotope hydrology."

Dr. Friedman joined the Navy in 1944, and was assigned to the Naval Electronics Laboratory in Washington, D.C. While there, he met Rita Vicary, who was working for British Intelligence. The two spent weekends hiking in the Shenandoah Mountains, sharing a love for the outdoors that would last for decades. They were married in 1946.

In 1952, Dr. Friedman joined the USGS in Washington, D.C., and worked for the USGS for more than 43 years. When the Isotope Geology Branch of the USGS was created in 1962, he and Rita moved to Lakewood, Colorado. Bob Rye, a research geologist at the USGS in Lakewood and a close friend of Dr. Friedman's since 1962, said, "Everything we do in hydrogen isotopic geology goes back to Irving.... He was a great teacher. It was very exciting to be in his laboratory—a stimulating, interesting, great environment for science." Until Dr. Friedman



COURTESY RITA FRIEDMAN

retired in 1995, he often bicycled to work. After retirement, he remained active as an emeritus scientist.

His scientific career was a pursuit of the understanding of every aspect of the water cycle. Throughout his career, he studied water in oceans, rivers, lakes, glaciers, the atmosphere, magmas, minerals, rocks, meteorites, plants, animals, and the moon. He made major contributions to a number of fields through application of stable isotope geochemistry. Friedman also made significant contributions to the development of instruments used to predict earthquakes, and to detect helium in exploring uranium, thorium, petroleum, and natural gas. In the 1940s, he made major contributions to the study of hydrothermal growth of quartz, which made possible the development of the synthetic quartz industry.

His scientific work was featured in more than 200 publications. His first was published in 1945, and his last will be published this year on Yellowstone National Park. According to Yellowstone Center for Resources Director John Varley, finishing his career with a Yellowstone scientific paper seems fitting for Dr. Friedman, as he greatly advanced the knowledge of the park for decades. His work on the geochemistry of obsidian allowed huge advances in

archeology and anthropology in the park and worldwide. He conceived and implemented a low-cost method of monitoring Yellowstone's total geothermal output that will continue to be the standard for many years to come. He was a legend in the park for his ability to "instrument anything," even if it called for string and glue, but he is also reputed to be the first in the park to use a newfangled gadget now commonly known as a datalogger. Dr. Friedman's insight and understanding of geothermal and water systems made him the first of the "usual suspects" always rounded up whenever the park had to answer a tough question about geysers, hot springs, or water, and he served as a National Park Service representative on several interagency science committees dealing with these issues. The future in Yellowstone without Irving—its geothermal "soul"—will be greatly diminished by his absence.

Dr. Friedman received several awards and honors during his lifetime. He received the Department of Interior Meritorious Service Award and the Congressional Antarctic Medal. He was made an Honorary Fellow of the Geochemical Society in 2002. He was recently honored by the Society for California Archeology for his role in the development of obsidian hydration dating. He was also recently made an Honorary Yellowstone Park Ranger, complete with flat-hat, and celebrated for his longtime contributions leading to better protection of the park and its resources.

Dr. Friedman's interests included skiing, exploring coral reefs and sunken warships while SCUBA diving, flying his own plane, and traveling with Rita. He is survived by Rita and a niece who lives in the Boston area.

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THOMAS MORAN WATERCOLOR, FIELD SKETCH OF GRAND CANYON PINNACLES, 1871. YNP, MUSEUM COLLECTION, YELL #3540

Yellowstone, Art, and the Emergence of Aesthetic Conservation

Peter H. Hassrick

THOMAS MORAN, FROM SKETCHBOOK, 1871. YNP, MUSEUM COLLECTION, YELL #23061-05

This article is based on the book, Drawn to Yellowstone: Artists in America's First National Park, by Peter H. Hassrick, published by the Autry Museum of Western Heritage in association with University of Washington Press, 2002, which granted permission for Yellowstone Science to use text excerpted from the book.

The traveling art exhibition, Drawn to Yellowstone: Artists in America's First National Park, traces the artistic history of the park from its earliest explorers to the present day and includes 60 paintings and drawings loaned from public and private collections. It was organized by the Museum of the American West, Autry National Center, Los Angeles, California. Yellowstone loaned nine pieces of art to the exhibition.

IN 1915, the famed environmental writer and activist Enos Mills declared, "The establishment of Yellowstone National Park was a great incident in the scenic history of America—and in that of the world. For the first time, a scenic wonderland was dedicated as 'a public park...for the benefit and enjoyment of all the people.'"¹ Mills, who had been the primary moving force behind the creation of Colorado's Rocky Mountain National Park that year, was addressing not just one, but three periods of time. For while he referenced Yellowstone's

historic founding in 1872, he was also conceptually implying the present and the future.

Early in the twentieth century, the national park system expanded to encompass vast acreages in Montana and Colorado—Glacier National Park in 1910 and Rocky Mountain National Park in 1915. Both had won congressional support only after protracted and contentious public debate about the wisdom of removing them from the domain of practical commercial utility. The argument of U.S. Representative Edward

T. Taylor of Colorado, that the area to be set aside as Rocky Mountain National Park was of “no value for anything but scenery,” essentially repeated similar logic that had won the day for Glacier five years earlier, and in many ways for Yellowstone 43 years earlier.² What Mills considered his own national park in Colorado had, in its agonizing birthing process, manifested a significant triumph for the forces of scenic preservation.

Just one year later in 1916, the passage of the National Park Service Act was, like the creation of Glacier and Rocky Mountain national parks, a defining moment in American conservation history. It portended future victories in an ongoing, hard-fought battle that pitted men like Gifford Pinchot, who strove for utilitarian conservation of the nation’s natural resources, against such adversaries as John Muir, who championed the ideal of preserving natural scenery for its own sake.

Just as Muir can be regarded as the leader of the cause for scenic preservation, Stephen T. Mather, an assistant secretary for the parks under Secretary of the Interior Franklin K. Lane, and Mather’s administrative assistant, Horace M. Albright, brought about the structural and philosophical changes that assured the salvation and perpetuation of the concept of aesthetic conservation, which in simple terms calls for preserving things because of their beauty rather than their usefulness. Their energies and determination led to the establishment of the National Park Service. And, as historian Donald Swain has written, it was ultimately “the rise of the National Park Service [that] marked the coming of age of aesthetic conservation in the United States.”³

Mather celebrated this achievement by calling for a special national parks conference. As a complement to the conference and as a testament to his appreciation for the aesthetic in nature and the role of art in public life, he also arranged for a major loan exhibition of works picturing views from American parks and monuments to take place at the National Gallery of Art in Washington, D.C., in 1917. William Henry Holmes, one of the first professional artists to visit Yellowstone National Park, was serving as the museum’s curator of art collections (he would become director of the museum four years later) and, as a close friend, helped Mather select the 27 artists and 45 artworks for the show. The three titans of late nineteenth-century western landscape painting—Thomas Moran, Albert Bierstadt, and Thomas Hill—were each represented by works from their favorite parks—Yellowstone, Rocky Mountain, and Yosemite, respectively. One of John Twachtman’s magnificent impressionist canvasses, *Waterfall, Yellowstone Park*, was loaned by the City Art Museum of St. Louis.⁴ The exhibition was titled, *A Loan Collection of Fourty-Five [sic] Paintings Illustrating Scenes Mainly in the National Parks and Monuments of the United States*. Mather had, as he ushered in the new agency, affirmed what he regarded as the fundamental connection among nature, aesthetics, and the public.

* * *

Yellowstone National Park is only one of America’s natural wonders to have served as studio and subject for artists over the past two centuries. Virginia’s Natural Bridge, the Catskills along the Hudson River, Niagara Falls, and the Yosemite Valley joined a host of other features of the national landscape to command attention from painters by the mid-1800s. In subsequent decades, various cadres of artists explored and exploited the pictorial richness of whole regions, especially in the West.

Yellowstone’s scenery, when compared with other splendors of the West, ranks as somewhat subdued—remarkable more for its repertoire of marvelous eccentricities than for its dramatic scope. But in the long history of America’s search for national identity and artistic satiation in such places of natural wonder, Yellowstone has played an extraordinarily important and beneficial role: this remote corner of Wyoming, with its universal appeal, became a unique symbol of wilderness and beauty in American culture. From this region flowed, like the waters pulsing from its geysers, an artistic energy that at once captivated a nation and contributed to its philosophical and aesthetic history.

Among the myriad artists who visited and drew inspiration from Yellowstone, none was more heralded and more a forerunner than the painter Thomas Moran. In 1871, he was the first of two professional artists (the other being the topographical draftsman and painter Henry Wood Elliott) to visit Yellowstone and record its likeness. Moran’s watercolors, along with a set of powerful photographs by William Henry Jackson, were used by Ferdinand V. Hayden to help persuade Congress to pass the Yellowstone Park Act. Over the years Moran became, in the public mind at least, “*the painter of the Yellowstone*,” and he almost single-handedly turned the region into a mecca for other artists of his and future generations.⁵ It beckoned him to return several times over his long career, and worked similar charms on hundreds of others. Moran once wrote:

*I have wandered over a good part of the Territories and have seen much of the varied scenery of the Far West, but that of the Yellowstone retains its hold upon my imagination with a vividness as of yesterday... The impression then made upon me by the stupendous & remarkable manifestation of nature’s forces will remain with me as long as memory lasts.*⁶

With Moran’s role in Yellowstone Park’s creation and subsequent history, it might be presumed that the park was founded in large measure on aesthetic grounds. In the enabling legislation, however, there is no mention of aesthetic, spiritual, or cultural values.⁷ Convinced that it was no good for farming or mining, the signers of the Yellowstone Park Act primarily wanted to preserve the area’s natural curiosities, prevent private acquisition and exploitation of its wonders, and set it aside as a “pleasuring-ground” for the general “benefit and enjoyment of the people.” At the time, American attitudes were essentially based on a public proclivity for exploitation of all available resources, for advancement of progress at all costs.

Aesthetic Conservation and the National Park Service

by Alice Wondrak Biel

THOUGH ACTIVISTS like John Muir would come to use the term interchangeably with “scenic preservation,” early National Park Service (NPS) officials practiced a brand of aesthetic conservation unique to their own needs at the time, and their interpretation of the NPS mandate to “conserve the scenery and the natural and historic objects and the wild life therein.”

In the early twentieth century, National Park Service framers Stephen Mather and Horace Albright were both devotees of aesthetic conservation. Their approach adhered to basic conservation principles of sustainability and efficiency, but departed from traditional, utilitarian conservation by advocating non-extractive forms of resource use, such as recreation and sightseeing. As practiced by Mather and Albright, utilitarian and aesthetic conservation shared a common goal—that resources not be wasted—and a common guiding principle—the greatest good for greatest number for longest time. However, where utilitarian conservation met that goal by scientifically regulating extractive practices, aesthetic conservation strove to ensure that the nation’s resources produced pleasure in the people for whom they were conserved.

It followed, then, that national park resources (the NPS’s very use of the term “resources” to describe things like grizzly bears, arrowheads, and geysers is testament to its conservation roots) that were not seen by people were often considered to be wasted. With the goal of maximizing visitor enjoyment, Albright believed that the NPS had a “duty to present wildlife as a spectacle” for public enjoyment. Beginning in the early

1920s, the NPS established several wildlife viewing areas where visitors could easily see examples of the park’s charismatic megafauna. In their various forms, these viewing areas included a “buffalo show corral,” a menagerie, and a series of “bear feeding grounds” located near the park’s hotels. These viewing areas made wildlife watching efficient, if unnatural and problematic.

Mather’s and Albright’s style of aesthetic conservation eventually fell out of favor with officials who started to re-think what it meant to retain Yellowstone’s resources “in their natural condition,” as mandated in the park’s Organic Act. By 1941, long after Albright’s 1929 departure from the NPS, all of the park’s famed bear feeding grounds had been closed. In 1946, the Otter Creek bear feeding facility, with its concrete feeding stage and log seating for 250 spectators—a monument to Albright’s guiding philosophy of aesthetic conservation in Yellowstone—was razed.

It is the visual imperative of aesthetic conservation, whose central importance was evident throughout Albright’s NPS career, that lends itself nicely to discussions of Yellowstone and art. In the early twentieth century, the ability of artists to capture Yellowstone’s resources and to interpret and communicate the park’s beauty and uniqueness to ever-broader audiences through visual means was recognized by Stephen Mather as a useful tool for promoting aesthetic conservation. Today, long after aesthetic conservation has ceased to be a driving force in NPS policy, Yellowstone-inspired art exists, persists, and is practiced on its own merits, but still for the good of us all.

So preserving land for public benefit, even if regarded as nothing more than a conglomeration of useless geological curiosities in the most remote reaches of the Rocky Mountains, was a significant step forward. Moran, and later Bierstadt, would reveal how colorful and special Yellowstone’s wonders really were, substantiating the worthiness of their preservation.

Yet, with all due credit to artists like Moran and Bierstadt, there was a healthy undercurrent of cultural enlightenment in regard to parks already in place at the time the park was established. Yellowstone National Park was presaged by the creation of several eastern city parks, including New York City’s Central Park and Philadelphia’s Fairmont Park. The distinguished planner and landscape architect Frederick Law Olmsted oversaw the conception of Central Park in the late 1850s and in the next decade was engaged in managing the Yosemite reserve for the State of California. Yosemite, as a public park, soon became something of a model for Yellowstone. As with the city parks and Yosemite, one rationale for Yellowstone’s inception involved its popular appreciation as an exceptional visual experience. Although not formally stated in the legislation, its wording suggested an awareness of, and propensity toward, aesthetic concerns. The very notion of a “pleasuring-ground” for public “enjoyment” held meanings for nineteenth century audiences that implied aesthetic regard. Since the eighteenth century, when German philosopher Immanuel Kant and British aesthician Edmund Burke defined the concept of the sublime as the most powerful of all human emotions, poets, painters, and planners had been enticing the public to find personal gratification in direct and vicarious (through artworks) association with raw nature. By the mid-nineteenth century there had developed a general demand for seeking aesthetic relationships with nature.⁸

Olmsted had designed Central Park with countless visual surprises—many of them, insofar as the urban scale would



Golden Gate, Yellowstone National Park, 1893. Thomas Moran (1837–1926). Oil on canvas, 36¼ x 50¼ inches. Buffalo Bill Historical Center, Cody, Wyoming. Accession number 4.75.

permit, hinting at grand and sublime views. Yellowstone, of course, could boast of such scenes in multitudes and magnitudes. Spectacular canyons, thunderous falls, exploding geysers and Dante-esque mud pots provided a plethora of wondrous sights. It was a veritable cornucopia of the sublime. And as the park matured, and its own planners like Hiram Chittenden laid out the sequences of public experience through roads and vistas, the most spectacular of the sublime visual experiences became the high points of any visit. Yellowstone became essentially a visual experience, and one with personal aesthetic relationships with nature at its core.

The designated views were not simply emotionally stimulating and aesthetically pleasing, but divinely sanctioned in the nineteenth-century mind. Nathaniel Langford, for example, who explored Yellowstone in 1870, wrote one of the first accounts of the Lower Falls. “The brain reels as you gaze into this profound and solemn scene,” he recalled. To this he added a spiritual tag. “I thank God that he has permitted us to gaze unharmed upon the majestic display of his handiwork.”⁹ It was as if Langford, who called for the establishment of a national park in Yellowstone, were endorsing a spiritual as well as a

political act, as if he felt that a divine and artistic collaboration were central to preserving and interpreting the boundless spiritual and emotional potential of Yellowstone. That is why artists like Moran and Bierstadt were so engaged by Yellowstone’s scenery and so fundamental to its public appreciation. They were spiritually and emotionally wed to their subject, and they were true artistic masters of the sublime.

Frederic Remington, whose vision was typically more prosaic, claimed Yellowstone’s wonders to be beyond the command of the painter. When Remington saw Moran’s painting *Golden Gate to Yellowstone* at the National Academy of Design in 1893, he said he “marveled at the man who dared the deed” of transferring the scene to canvas. For Remington, such “marvelous vistas of mountain scenery [were] utterly beyond the pen and brush of any man.”¹⁰ His illustrations, like *On the Headwaters – Burgess Finding a Ford*, 1893–1895, presented a generalized, almost vacant landscape, yet his theme, the soldiers policing the park for poachers and those who might desecrate its delicate features, resonated with the call for preservation of natural wonders. While not renditions of the sublime in nature, his works recognized the worth of pristine wilds as a benefit, if not

a right, for the people. And in his review of Moran's painting, he certified that some painters could, if they brought sufficient talent to bear, succeed at depicting the wonders of the park.

For Moran and other landscape painters of his day, their aesthetic mission was considered part of a larger national imperative. After the Civil War, artists like Bierstadt and Moran were challenged to seek out and paint symbols of national unity. Because of a perceived cultural inferiority, Americans were also anxious to find and reveal symbols of national identity that would compete with those of Europe. The Hudson River School founder, Thomas Cole, and his kindred spirit, Asher B. Durand, had helped their countrymen define and appreciate wilderness as that unique quality that set America apart from Europe. The wilderness was to be gloried in, and nothing could be wilder, at least in the public mind, than that northwest corner of Wyoming called Yellowstone. By Moran's and Bierstadt's day, wilderness had become a broadly accepted cultural asset despite its contemporary conquest at the hands of progress. In it, as suggested in Bierstadt's *Yellowstone Falls*, circa 1881, was revealed God's blessing and the concomitant righteousness of the American experience. Bierstadt, who saw Yellowstone's topography as an expression of "infinite divinity," enshrouded the falls in diaphanous clouds to celebrate nature's mysteries and caused its elegant pines to bow before the font of one of America's mightiest water sources to symbolize the nation's power, richness, and sanctity.¹¹

Moran's earlier (1872) monumental painting *Grand Cañon of the Yellowstone* (see the cover of this issue of *Yellowstone Science*) was also intended to "satisfy the myth of a bigger, newer, America" and to enlighten the nation as well as entertain its people.¹² Such a large-scale piece (7 × 12 feet) was the successor of the famous rolling panoramas that were popular before the Civil War and were frequently referred to as "machines." Some observers, when they saw the large canvas, wondered aloud when the image would move.¹³ Despite its static presence, the format provided Moran with an artistic voice that was exalting and operatic in dimension.

The painting, which had created a sensation when shown in New York in 1872, was soon shipped to Washington, D.C., at Hayden's suggestion and encouragement. With Hayden's persuasive assistance, Congress eventually purchased the canvas for the U.S. Capitol. It was a coup for Moran and a relief for observers of federally commissioned art that decorated, though some felt desecrated, the marble halls of the nation's seat of government. Moran's was the first landscape painting to hang in the Capitol, where the walls were covered with giant history machines like William H. Powell's *Discovery of the Mississippi by DeSoto* (1847–1853) and Emanuel Leutze's *Westward the Course of Empire Takes Its Way* (1861). Moran's spread could be considered a history painting, too, albeit natural history, with the tiny figures posed at the brink of Yellowstone's gaping canyon. Yet it was fresh and pleasing to the tastes of the time, not one of those "unhappy productions" with their "academi-

cally severe glimpses" of America's past that rankled the critics and the public.¹⁴ It was a celebration of America's first national park.

In picturing the canyon's dramatic erosive elements, the painting featured some of the country's ancient remnants. Those spires and minarets psychologically associated with Europe's antiquities thus provided a homegrown legacy to help satisfy America's appetite for a history that reached back further than 100 years. The surging water over the distant falls proclaimed the nation's power and suggested a continuity of greatness over time to come. And the explorer Hayden and his troop, gathered before the splendor, showed in subtle but visionary artistic rhetoric that Americans could conquer even the remotest corner of their continent. The American Indian at Hayden's side, turning his back on the scene but directed by Hayden's gesture to gaze back over his shoulder, may be seen as a metaphor for progress. As America subdued its wilderness, preparing its "unexampled richness" for what *Scribner's Monthly* in May 1872 termed "the pleasure tourist" and ensuring that "the region...shall be kept in the most favorable condition to attract travel and gratify a cultivated and intelligent



Yellowstone Falls, circa 1881. Albert Bierstadt (1830–1902). Oil on canvas, 44¼ × 30½ inches. Buffalo Bill Historical Center, Cody, Wyoming. Gift of Mr. and Mrs. Lloyd Taggart. Accession number 2.63.

curiosity,” the Indian faced in the other direction. As pupil of the white “discoverer,” the handsomely arrayed warrior was effectively removed from the broader implication of the West as a capstone to the nation’s progress.¹⁵

The painting was important, too, on purely aesthetic grounds. Moran, who throughout his career attached his artistic inspiration to American tendencies and subjects, had grown up in Philadelphia. His family emigrated from England in 1844, and he studied art under his older brother, Edward, and a painter of romantic seascapes, James Hamilton. Encouraged by both mentors, Thomas escaped America during the Civil War to study the works of J.M.W. Turner in England and to understand John Ruskin’s fascination with Turner’s landscapes. Ruskin had praised Turner for his imaginative landscapes, such as those of the Alps in which he added glory to the mountains by endowing them with his own emotional power, thus creating a “noble landscape.”¹⁶ Moran admired that and, at least in his early career, was interested in combining the emotional sway with what Ruskin and his pre-Raphaelite followers would applaud: a literal transcription of nature. The lessons he took from England served him well as he painted his *Grand Cañon of the Yellowstone*. Hayden confirmed the veracity of Moran’s geological forms, while the scale and drama of the painting proved that the artist, in creating a truly noble landscape, had invested it with the full measure of his emotional reserve.

Historian Wallace Stegner has said that Moran “in training and inspiration” was merely “Turner superimposed on Bierstadt.”¹⁷ But the art critics and public of the day saw the two artists in far more dichotomous terms. Moran was a “truth teller” with his naturalistic depiction of scale and color, while Bierstadt was regarded as little more than “clap-trap” because of his exaggeration of those elements. Though both explored their imaginations in rendering their final panoramic machines, Moran tended to veil the “awful and desolate” in nature by accentuating its “beauty and variety of color.”¹⁸ It was commonly believed at the time that Bierstadt, trained in Germany, did not have the beauty and honesty of rendition that “old Ruskin calls for” and that was preferred by American audiences.¹⁹ While Moran’s *Grand Cañon of the Yellowstone* was spoken of as “a singularly beautiful and original work,...the composition skillfully managed, and the harmony of color...instinctive...as the true poet’s verse,” Bierstadt’s monumental *Domes of the Yosemite*, which measured 9½ by 15 feet and was featured publicly in New York only a few days after Moran’s premiere, garnered far less flattering reviews. Such works, according to James Jackson Jarves, satisfied only those “Americans who associate them with the vulgar idea of ‘big things’ as business.”²⁰ Freed from Bierstadt’s bombast, Moran’s subject and ambition required a symphonic response focused by his search for clarity of articulation and detail. For Americans, the English aesthetic was favored over that of the Germans.

In the mid-1890s, a New York impressionist painter, John Twachtman, was granted a private commission by Major Wil-

liam A. Wadsworth of Genesco, New York, to travel to Yellowstone to produce a series of paintings on the park’s wonders. He was able to provide American audiences with quite a different aesthetic interpretation of the park than Moran and Bierstadt while, at the same time, awakening new energy in his own creative process. Many of his mature oils communicate an elegiac air, yet Twachtman’s paintings of Yellowstone sang out as robust anthems to nature’s splendor. He was dazzled by the falls and aglow with the brilliance of the crystalline clarity of features like Emerald Pool.

Twachtman painted many views of what he called the “romance” shared by the canyon and the falls. In them he generally presented a frontal view with reduced tonal values that tend to flatten the perspective and the illusion of space and harmonize the various elements. “The result,” according to art historian Novelene Ross, “is a tension between an illusion of nature in three dimensions and the two-dimensional patterns of the painting’s design. This tension is the hallmark of Twachtman’s mature style.”²¹ Geological shapes and details, dissolved in light, were left to glow in iridescent, hushed spectacle, as seen in *Waterfall in Yellowstone*, circa 1895.

Fellow painter Thomas Dewing wrote in an homage to Twachtman published in 1903 that beyond his mastery of harmonious atmosphere and values, Twachtman had “also painted studies of the more spectacular parts of America, like the Yellowstone Park...interesting because of their point of view, as examples of the modern rendering...” Like Moran, Twachtman had set the stage for others to follow, discovering in the park occasions for exploring the fundamental beauty of design, the graceful rhythms of nature’s countenance, and the joy of rendering its colors so splendidly arrayed. The artist felt a special connection to this distant place. His fellow impressionist J. Alden Weir summarized Twachtman’s contribution to American art in a phrase that encapsulated the Yellowstone experience. In “Twachtman’s canvases,” he wrote, “one is made to feel the spirit of place and the delight with which his work is done.”²² The sublime had been replaced with a personalized reverie even more poetic than Moran’s.

Another artist who felt the spirit of place was Montana’s Charles Russell, who visited Yellowstone in 1902. He hoped to return in subsequent years, but never did. In 1917, he had met A.W. Shaw, a general partner in the Shaw and Powell Camping Company that operated tours and tent facilities in Yellowstone. Evidently, according to an exchange of correspondence that followed, the two men discussed Yellowstone’s wild animal population. Shaw probably boasted that, as Robert Sterling Yard had proclaimed in his popular *National Parks Portfolio* of 1916, “the park was one of the largest and most popular game preserves in the world.” Or perhaps he cited the opinion of eminent photographer Dwight Elmendorf that Yellowstone was “a vast outdoor museum for...all living creatures that found their way there.”²³ Russell remained skeptical, it seems, likely parroting the typical tourist complaint that the animals

could not be seen along the standard travel routes. Shaw wrote Russell later:

I have just been up to the park headquarters at Mammoth Hot Springs and returned. There is plenty of game in sight of the road between Gardner [sic] and Mammoth.

I counted 15 mtn. Sheep, 397 elk and many deer both black and white tail. The sheep and in fact all of the game would hardly get out of the road.

My reason for writing you is that in mentioning you to Mr. [Chester A.] Lindsley, the Supervisor of the Park, and in telling him of your interest in game—he urged me to extend you an invitation to come up to the Post at Mammoth. He

said that not knowing you he hardly felt like writing you, but he wished me to assure you he would be very glad to extend to you the hospitality of the post.²⁴

Russell's tongue-in-cheek response, in a handsomely illustrated letter, revealed his fundamental conservatism and antipathy for anyone, including the government, who wanted to impose change on "God's Country:"

I did not get your letter till I reached home but I thank you and Mr. Lindsley for the kind invitation and if that holds good I may visit him some other time maby next year I would like to have one more look at a game country before they turn the parke into a sheep range and they geysers to a steam laundry theirs an awfull wast of hot water in the Yellowstone park enough to wash in side and out all the reformers in the state and theirs a few on them.²⁵



Waterfall in Yellowstone, circa 1895. John Henry Twachtman (1853–1902). Oil on canvas, 25³/₈ x 16¹/₂ inches. Buffalo Bill Historical Center, Cody, Wyoming. Gift of Mr. and Mrs. Cornelius Vanderbilt Whitney. Accession number 22.69.

Russell often used his art to proclaim the urgency of wildlife and scenic conservation.

A contemporary of Russell's, Abby Hill of Portland, Oregon, had been encouraged at a young age to use her innate talent to pursue an art career. Like many young ladies of her day, Hill studied art in traditional circumstances—in 1882 with a private instructor, H.F. Spread in Chicago, and in 1888 with William Merritt Chase at New York's Art Students League. Chase convinced her that through art, nature reveals its real beauty and human accessibility, reputedly telling her that "artists make the world beautiful for others because they see more of its beauties and so teach others to see them." As a consequence of her professional devotion, she led a rather unconventional, exciting, and peripatetic life.

In 1903, through dint of her persuasive powers and the impressive portfolio of paintings that she had assembled, Hill was granted a commission from the Great Northern Railroad to sketch scenery along the railroad's routes in Washington state. In the next two years, under the auspices this time of the Northern Pacific Railroad, Hill moved farther afield, reaching Yellowstone National Park by mid-August of 1905. It was there that she produced some of her most memorable work.

In preparation for her first Yellowstone jaunt, Hill spent six months in Washington, D.C., at the school of the Corcoran Gallery of Art. Though a student in life classes, her prime accomplishment was a copy she made of the gallery's Albert Bierstadt painting *Mount*

Corcoran. When she left Washington for the Rocky Mountains, she was ready to face the challenge of Yellowstone's novel and daunting scenery.

Hill completed her painting *Yellowstone Falls*, 1905, in a couple of weeks, despite interruptions by natural annoyances such as hailstorms, earthquakes and rain, as well as the irksome intrusions of tourist gawkers who critiqued her efforts. At one point, as the painting neared completion, the most challenging obstacle of all confronted the artist: gale-force winds along the canyon rims.

Despite Hill's earlier efforts at replicating Bierstadt's grand panoramic vision of Mount Corcoran, it was to Chase's example that she turned when presented with Yellowstone's canyon and falls. Her vigorous brushwork and highly keyed, sunny palette were resolved in an overall tonal harmony. "Tonality is perhaps the masterful maturity of technique," Chase would write in 1908, "impressing more definitely than any other quality the beauty, the very best of ideal, Nature, — in art."²⁶ Whether perched on the canyon rim or huddled just out of spray's reach beneath the falls, Hill strove to reveal a harmony in nature with which the public might identify. Her achievement was indeed a "masterful maturity."

A number of foreign-born artists explored the park over the years. The Austrian painter Gustav Krollman (1888–1962) painted in Yellowstone in the 1920s. Born in Vienna and trained there at the Academy of Fine Arts as a portrait painter, Krollman immigrated to the United States in 1923. He settled in Minneapolis where he enjoyed a prosperous career as an art instructor, portrait painter, and muralist.²⁷ In the late 1920s, he signed on with the Northern Pacific Railroad to carry out a promotional poster campaign. Like Abby Hill a decade before, Krollman painted spots along the route that would entice visitors.²⁸ Since Yellowstone Park was one of the highlights, Krollman is said to have visited there several times.

Krollman's watercolor *Old Faithful Geyser*, circa 1925, is one of a series completed for sale in the Haynes Picture Shops around the park. Its fresh naturalism contrasts sharply with the more stylized renditions of the same scene produced as a railroad poster. In the latter, nature's formidable force is pendant to the pleasant intrusion of man's accessories; the hotel on one side, the tent camp on the other, and a carload of static, oddly disinterested tourists in the foreground. It is likely that Krollman had seen a similar, though considerably more animated poster executed a decade earlier by the German master of poster art, Ludwig Hohlwein (1874–1949). If Krollman's Yellowstone posters were enticing for the railroad's patrons, Hohlwein's were utterly seductive. His *Yellowstone-Park*, a color lithograph circa 1910, carries the quintessential message of tourist pleasuring without the slightest hint, beyond the bold letters, of its locale. For its time and its purpose, Hohlwein's *Yellowstone-Park* may well rank as the park's most compelling painted image.

During the early 1920s, Yellowstone National Park witnessed a surge in public appeal. At the same time that conserva-



Old Faithful Geyser, circa 1925. Gustav Krollman. Watercolor, 18 x 13 inches. Montana Historical Society, Helena, Montana. Haynes Foundation Collection. Gift of Mrs. Isabel Haynes.

tionists Aldo Leopold and Arthur Carhart were convincing the U.S. Forest Service to set aside "primitive areas" with restricted use and accessibility, the country's parks were experiencing a dramatic democratization. Horace M. Albright, who became superintendent of Yellowstone in 1919, championed the cause by working to make the park open and available to the broadest possible cross-section of the public. In this he was reflecting the viewpoint of his mentor and boss, Stephen Mather, and would accomplish his goal over the next decade of service in part by upgrading roads and facilities throughout the park.²⁹

As a result, gateway communities prospered, in-park concessioners were consolidated and blossomed, and the railroads took full advantage of the new prospects. Artists were called upon to complement these efforts and often, in the process, to commodify the nation's flagship preserve for more popular consumption of its charms. At times, such endeavors to ally art and promotion had surprising results with impacts well beyond mundane public titillation. One case in point developed from

the vaporous eruption of Old Faithful as recorded by the park's official photographer, Frank Jay Haynes. The photograph, simply titled *Old Faithful*, had gratified the souvenir appetites of countless tourists over the years and had graced the pages of Northern Pacific Railroad brochures for some time. It proudly carried the caption, "the most celebrated picture of this geyser," and represented no small feat of photographic art. Haynes was surprised to learn in 1925 that it had also provided the inspiration for one of America's preeminent sculptors, Daniel Chester French (1850–1931). In 1924, the Corcoran Gallery of Art acquired an elegantly graceful marble sculpture by French, *And the Sons of God Saw the Daughters of Men That They Were Fair*. The museum's acquisition records state that French was moved to "create this piece through seeing its silhouette in 'Old Faithful Geyser.'" Washington newspaper accounts of the museum's purchase, with headlines boasting "New Masterpiece Here," mirrored the museum's internal record. "The composition was inspired by the billowy monumental form of 'Old Faithful' geyser in eruption...and through his genius the indefinite shape took on definite form and meaning."³⁰ When Haynes saw these notices, he knew right away that the sculptor's genius was based at least in part on the image he had created. At his request, subsequent promotion of the statue credited Haynes's model.



"Old Faithful Geyser. Plume. Yellowstone National Park." Circa 1885. Frank Jay Haynes. Montana Historical Society, Helena, Montana. Haynes Foundation Collection.

French, recognized as one of America's most popular and gracious sculptors of his day, was reaching the end of a long and prosperous career. He received the title of "dean of American sculptors" for his prolific output and his devotion to naturalism over the neoclassical idealism that had pervaded the discipline for the generation preceding him. As with the best of his work in these years, French's marble *And the Sons of God... or Love* (as he sometimes called it) is strongly pictorial and narrative. According to the Corcoran, it derives its story line from the account in Genesis "of the recreation after the flood; of the mating of the sons of God with the daughters of man." The dominant male figure, an angel, steps from a heavenly cloud to embrace an earthly female who reaches skyward from a rock. Symbolically, man is invested with spiritual ordination to quicken the earth, bolstered by the physical perfection of his presence. The metaphor might be read as virginal Yellowstone surrendering to divinely guided man for his pleasure. It took almost five years to create and, in the critic's estimation, was one of "the finest works yet produced by an American sculptor."³¹ When, in 1937, Dr. Clyde Max Bauer published his then-definitive volume on *Yellowstone Geysers*, the Haynes photograph of Old Faithful was juxtaposed with French's statue.



The Sons of God Saw the Daughters of Men That They Were Fair, 1923. Daniel Chester French. Marble, 79½ x 42 x 25 inches. Corcoran Gallery of Art, Washington, D.C. Museum Purchase. Accession number 24.1.

Here was a remarkable union of science and two branches of art: sculpture and photography.³²

Within 50 years of its founding as a park, Yellowstone had become the nation's art studio, one in which the creative forces were inextricably allied with some of the world's most magnificent natural wonders to stand nationally, if not universally, for conservation. In Yellowstone, America discovered a pure visual experience, a scene that was found to be worthy of preservation in its own right and one that would enrich the nation's spirit and enhance its self-estimation. For once, the American people, who were viewed from around the world as driven primarily by mercenary impulse, could define themselves in Yellowstone's context as satisfied with and emboldened by an aesthetic motive and an unencumbered celebration of nature and wilderness. Certainly, it was a scene and an experience that was eventually commodified as the tourism impulse and industry took hold, but at last the sheer beauty and sublimity were preserved and today, as in 1872, Yellowstone is still a cherished personal, visual experience for millions. In all the ways that Yellowstone has been a complex, engaging experiment, none has been more fascinating to watch than the development of its art and the emergence there of aesthetic conservation.

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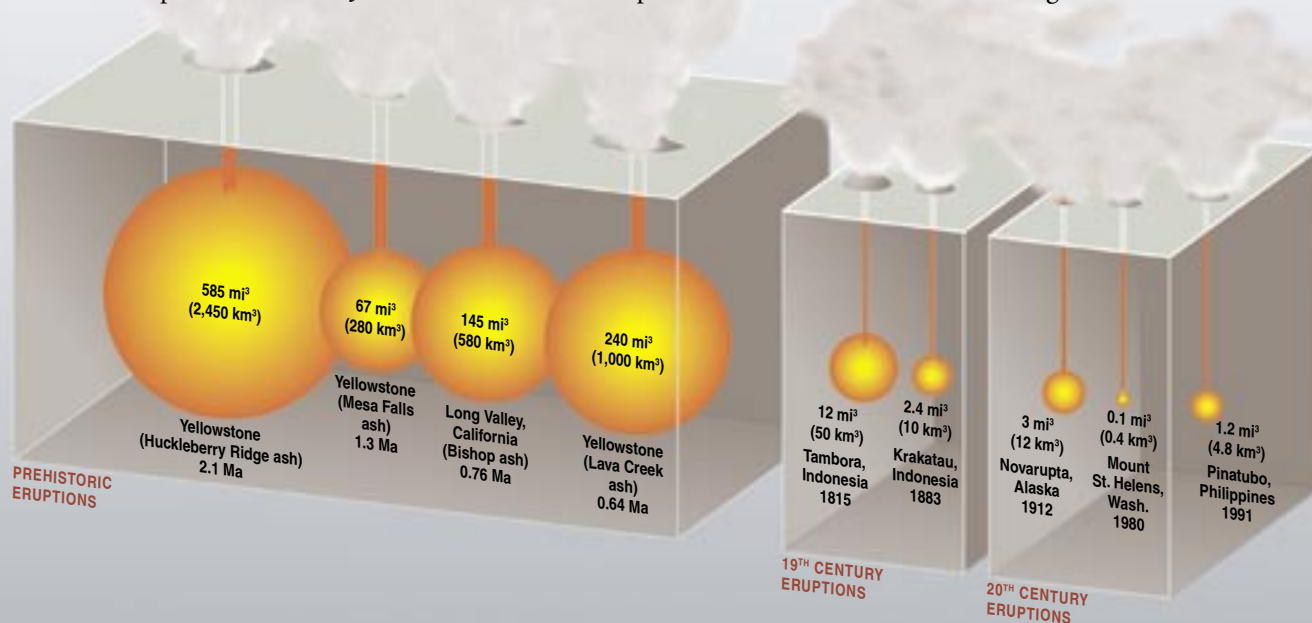
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Truth, Fiction and Everything in Between at Yellowstone

Jake Lowenstern

Reprinted from the June 2005 *Geotimes*, with permission from the American Geological Institute.



Explosive eruptions are best compared by recalculating the volume of erupted volcanic ash and pumice in terms of the original volume of molten rock (magma, shown in orange above) released. In this context, the magma released from Yellowstone's Huckleberry Ridge eruption 2.1 million years ago was nearly 6,000 times greater than the volume released in the 1980 eruption of Mt. Saint Helens in Washington.

WHEN I WAS ASKED TO TAKE OVER as scientist-in-charge of the Yellowstone Volcano Observatory (YVO) in 2002, I was unaware that soon I would be responding to a rapidly growing urban legend (or perhaps a rural one in this case). Just Google for the words “Yellowstone” and “Doomsday,” and you’ll find hundreds of entries from scores of web sites warning that the world is about to end at the hands of America’s first national park and largest restless caldera.

Of course, the Yellowstone caldera is a volcano, and it almost certainly will erupt again someday. It’s possible, though unlikely, that future eruptions could reach the magnitude of

Yellowstone’s three largest explosive eruptions, 2.1 million, 1.3 million, and 640,000 years ago. Smaller eruptions, however, are far more likely, and no eruption seems imminent on the timescale that most people truly care about—their lifetime or perhaps even the next few hundred or thousands of years.

These realities, however, do not always make it into the coverage we see in TV documentaries, on the Internet, or in the popular press. Sometimes, the media bends the realities to make for better entertainment rather than better science, as evidenced by my experiences over the past three years evaluating everything from fictional movies about Yellowstone to dispelling myths on Internet chat rooms.

So, why all the attention on the Yellowstone volcano now?

What Actually is Happening

So, why all the attention on the Yellowstone volcano now? Although scientists first recognized Yellowstone's history of repeated titanic eruptions back in the 1960s, the general public became aware of them only during the past five years or so. The upsurge in interest can be tied partly to the release of an episode of the BBC-produced *Horizon* in 1999, which addressed volcanic eruptions at Yellowstone and was frequently replayed in the United Kingdom and in North America on the Discovery Channel.

Around the same time, the U.S. Geological Survey (USGS) signed a memorandum of understanding with the University of Utah and Yellowstone National Park to create YVO. The idea was to formalize what had been an unofficial observatory for many years and create a stronger framework for monitoring and research. A few years later, in late 2002, a number of geological factors contributed to ramping up public interest in Yellowstone and its volcanic potential.

First, surface waves from the magnitude-7.9 Denali, Alaska, earthquake triggered about 400 small temblors within the park, 3,100 kilometers (about 1,900 miles) distant from the epicenter. Next, Steamboat Geyser, Yellowstone's tallest and most unpredictable geyser, erupted in March 2003, and again in April and October. A new and vigorously steaming 75-meter (245-foot) line of steam vents erupted within sight of the Mammoth-to-Norris road. A trail in the Norris Geyser Basin was closed because of increased steaming and resulting elevated ground temperatures. Our coordinating scientist Robert B. Smith of the University of Utah spearheaded a seismic and GPS-based experiment trying to understand the nature of the changes to hydrothermal features at Norris.

At the same time, new USGS mapping of thermal features on the floor of Yellowstone Lake resulted in a flurry of articles on Yellowstone's potential for hydrothermal explosions—events in which geothermal groundwater is flashed to steam, hurling rocks substantial distances and forming craters. These articles reasonably highlighted the active thermal features beneath the lake and the importance of hydrothermal explosions, but they also incorrectly implied that active “bulges” were rapidly forming beneath the lake, that they were ready to explode, and that they could cause volcanism in their wake.



Norris Geyser Basin in Yellowstone National Park.

Questions and Answers Regarding Volcanic Activity in Yellowstone National Park

Q: How imminent is an eruption of the Yellowstone volcano?

A: There is no evidence that a catastrophic eruption at Yellowstone National Park

(YNP) is imminent. Current geologic activity at Yellowstone has remained relatively constant since earth scientists first started monitoring some 30 years ago. Though another caldera-forming eruption is theoretically possible, it is very unlikely to occur in the next 1,000 or even 10,000 years. Scientists have also found no indication of an imminent smaller eruption of lava.

Q: How much advance notice of an eruption would there be?

A: The science of forecasting a volcanic eruption has significantly advanced over the past 25 years. Most scientists think that the build-up preceding a catastrophic eruption would be detectable for weeks, and perhaps months to years. Precursors to volcanic eruptions include strong earthquake swarms and rapid ground deformation, and typically take place days to weeks before an actual eruption. Scientists at the Yellowstone Volcano Observatory (YVO) closely monitor the Yellowstone region for such precursors. They expect that the build-up to larger eruptions would include intense precursory activity (far exceeding background levels) at multiple spots within the Yellowstone volcano. As at many caldera systems around the world, small earthquakes, ground uplift and subsidence, and gas releases at Yellowstone are commonplace events, and do not reflect impending eruptions.

Q: In regard to volcanic activity, is it safe to visit Yellowstone?

A: Yes.

Q: What are park staff doing to monitor and assess the probability of an eruption?

A: The YVO maintains an array of instruments that monitor activities at Yellowstone around the clock. In addition, YVO scientists collaborate with scientists from all over the world to study and assess the hazards of the Yellowstone volcano.

Q: Can anything be done to prevent an eruption?

A: No. The temperatures, pressures, physical characteristics of partially molten rock, and the immensity of the magma chamber are beyond humans' ability to influence, much less control.

Q: How will the park get the word out if there is an eruption?

A: The park would communicate accurate, timely information to park visitors, park employees, concessioners, surrounding communities, media outlets, and other interested parties through the park's 24-hour Communications Center; news releases; established emergency response programs; and through notification of appropriate interagency, state, and local government agencies.

Q: Where would it be safe to be during an eruption?

A: For the most likely type of volcanic eruption in Yellowstone, everywhere would be safe except in the immediate vicinity of the advancing lava flow. In the highly improbable event of a large catastrophic eruption, the greater the distance from the eruptive center, the safer it would be. It is impossible to know the effects of the eruption without guessing at the explosivity of the highly unlikely eruption and the total amount of the material erupted.

To learn more about Yellowstone's volcanic past and to view current data about earthquakes, ground movement, and stream flow, visit the YVO website at <<http://volcanoes.usgs.gov/yvo/>>.

Eruption on the Small Screen

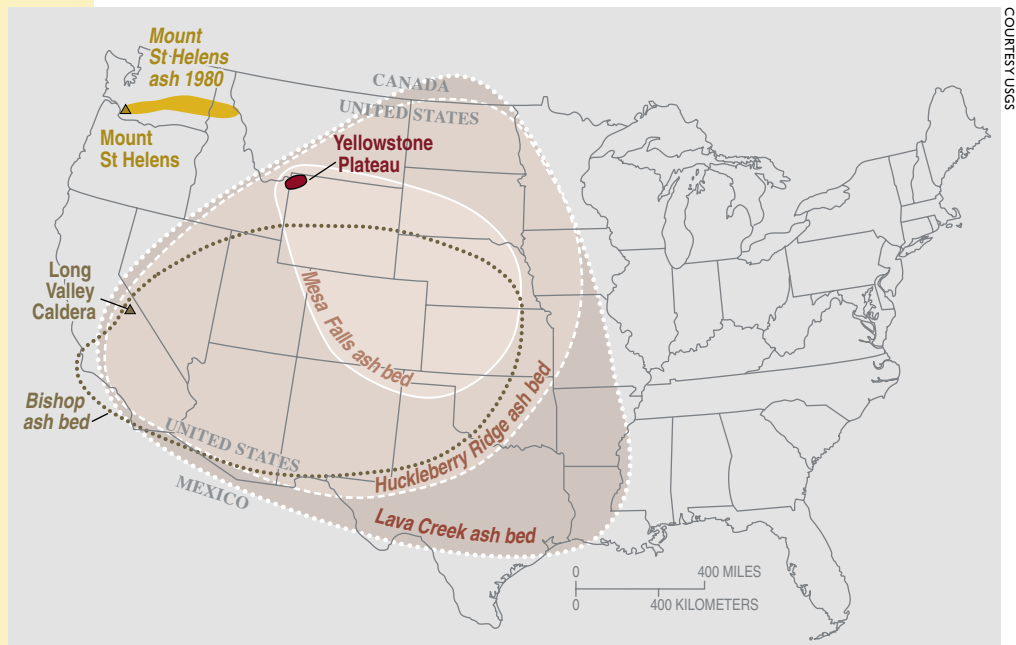
With all this attention on Yellowstone late in 2003, BBC Science decided to produce a two-hour "docudrama" on the volcano and its potential for widespread devastation. Entitled *Supervolcano*, it chronicled a near-future cataclysm modeled after the Huckleberry Ridge eruption 2.1 million years ago, which vented more than 2,500 cubic kilometers of volcanic debris (enough to bury the state of Texas 12 feet deep). The BBC movie cost approximately \$5.5 million to make and was co-produced with Discovery Channel, NHK, and several other global television interests. It premiered in the United Kingdom in March and in the United States in April 2005.

Prior to filming, the film's producer and writer visited scientists from the USGS, Yellowstone National Park, the University of Utah, and elsewhere in academia. They asked us countless questions during script development, including the following: How do you monitor the volcano? What phenomena imply an eruption? Who is responsible for what

tasks? What do you do in the field? Where do you stay? How do you get around? Later, we reviewed a draft script for the drama and provided them with our comments and critiques. Michael Riley, the actor playing the YVO scientist-in-charge, phoned me twice, and we had lengthy conversations about topics ranging from "my typical day" to dress code to the proper pronunciation of place names and geological jargon.

In the end, the BBC Science team did an impressive job of addressing the sorts of scientific issues we would grapple with during the start of an eruption. The drama unfolds as a true scientific thriller, both gripping and fact-filled. The characters, though based only loosely on real people, had motivations and interests similar to those of my colleagues and I. Although we strongly would have preferred portrayal of the effects of a small eruption, their intent was always to provide a worst-case scenario, and the final product did that very well.

Surprisingly, our experience with two documentary film programs was somewhat more negative. Both BBC and the



Eruptions of the Yellowstone volcanic system have included the two largest volcanic eruptions in North America in the past few million years. The biggest of the Yellowstone eruptions occurred 2.1 million years ago, depositing the Huckleberry Ridge ash bed. These eruptions left behind huge volcanic depressions called "calderas" and spread volcanic ash over large parts of North America.

National Geographic Channel requested our assistance on documentaries that would explore the effects of “supereruptions.” The BBC program followed its showing of *Supervolcano*, while the National Geographic program was for its series *Naked Science*. My naïve assumption was that the filmmakers

readers’ attention in Longmont, Colorado, in December 2003. Actually, the associated article in the local paper, the *Times-Call*, was quite good and with the exception of the headline, made no mention of any scientists who thought Yellowstone might be getting ready to erupt. I’ve since learned that headline

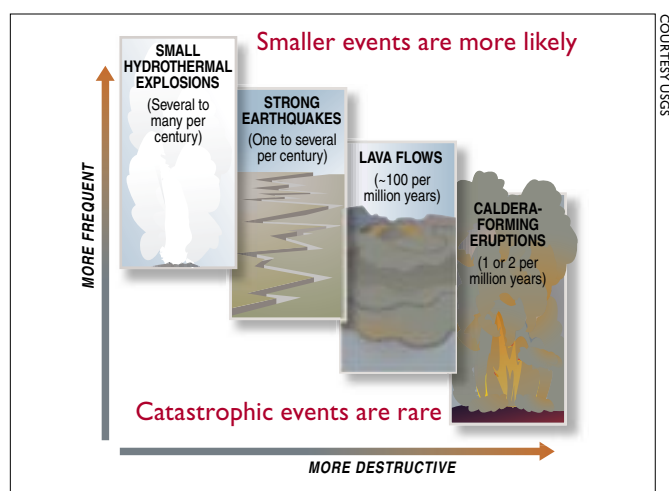
Not surprisingly, the Internet is the biggest source of misinformation about Yellowstone’s volcanic past and present.

would interview their subjects and then synthesize the results of what they had learned. In both cases, though, we felt as if our roles had been scripted beforehand and that the filmmakers relentlessly pursued several key quotes that fit neatly within their desired narrative.

We were never given the opportunity to critique the *Naked Science* program, and the final product was highly sensationalized. The BBC did allow us to view an early version of their documentary, one that we felt was highly misleading about actual geologic hazards and risks at Yellowstone National Park. Their revised program, entitled *The Truth About Yellowstone*, was broadcast in the United Kingdom and elsewhere overseas. Although it was much better than the earlier draft, it tended to focus more on corroborating *Supervolcano* than on providing an unbiased assessment of current events and likely volcanic scenarios. Discovery Channel opted to replace *The Truth About Yellowstone* with its own documentary hosted by Tom Brokaw. Overall, that documentary was balanced, providing both the science and the sensational with appropriate perspective.

Explosions in the Newspaper

“Under Pressure? Yellowstone may be getting ready to erupt, scientists say.” This alarming headline grabbed many



Scientists with the Yellowstone Volcano Observatory see no evidence that another cataclysmic eruption will occur at Yellowstone in the foreseeable future.

writers don’t always worry too much about matching headlines to storylines. They can creatively embellish the fundamental science without any serious consequences, at least to themselves.

And that has been true to a limited degree for the wide range of coverage Yellowstone has received in recent years in the *New York Times*, the *Los Angeles Times*, and CBS News, among many, many others. Coordinating scientists Robert Smith, Henry Heasler (the park geologist), and I have done interviews for scores of newspapers and magazines (including *Geotimes*), as well as television and radio news stories, some of which were accurate and reasonable, whereas others were sensationalized and twisted.

Generally, the most carefully researched articles about volcanism at Yellowstone have been penned by writers from the local newspapers in Billings, Montana; Jackson, Wyoming; and other nearby towns. This paralleled my experience at Mount St. Helens in October 2004, where the local writers were more likely to take the time to get the story right.

When confronted with a litany of potential eruption scenarios, local reporters covering Mount St. Helens thoroughly educated themselves about the volcano, its history, and the techniques used to monitor volcanic activity. They did not want to overstate the danger once they understood that a relatively nonhazardous effusive eruption was underway.

Similarly, at Yellowstone, local reporters were typically careful, whereas those sitting at a greater distance from the park often viewed the story as ripe for “titillation.” I don’t think it’s a coincidence that so much of the hyperbolic press on the Yellowstone volcano comes from the United Kingdom. In reading many of the U.K. news articles, I cannot but sense an unstated glee as the author recounts the future doom headed for their brethren “across the pond.”

Cataclysms on the Internet

Not surprisingly, the Internet is the biggest source of misinformation about Yellowstone’s volcanic past and present. By mid-2003, Internet news magazines and chat rooms had exploded with speculation and fabrications about current events at Yellowstone. One online report was cobbled together “from a series of articles, emails and official information.” It included nuggets such as “The [Yellowstone] Lake is now

closed to the public. It is filled with dead fish floating everywhere. The same is true of the Yellowstone River and most of the other streams in the Park.” Later in the same report came the following: “The movement of magma has been detected just three-tenths of a mile below the bulging surface of the ground in Yellowstone raising concerns that this super volcano may erupt soon.”

Needless to say, these statements were *not* true, and someone did not do a very thorough job of fact-checking—but that did not stop dispersal of these misleading reports all over the Internet. Similarly, an online web forum reported that the USGS had secretly sent 200 geologists into Yellowstone to study “the situation.” I can only dream that USGS had such resources!

Most of these articles referred to generic “scientists” who were worried about one thing or concerned about another. None of these people were ever mentioned by name, and I certainly haven’t met any of these generic scientists—but they sure did seem worried. As a result of these stories, enthusiasts flocked to our real-time data on seismicity, ground deformation, and stream flow, looking for any anomaly that might foreshadow an approaching eruption and devastation. Their musings provided fascinating, but unsettling, reading for YVO scientists. Wind, trucks, and snowmobiles were interpreted as tremors, swarms, and other signs of instability.

Although the denizens of these chat rooms may have had scant geological education, they were passionate. One online forum sent us a series of penetrating questions about how we monitor Yellowstone. Smith, Heasler, and I responded, knowing that our words would be posted on their web site. While we were unsure whether answering was a good idea, in the end, we responded as forthrightly as possible. While answering their questions, we admitted that our monitoring system could not predict certain kinds of events (for example, localized steam or hydrothermal explosions), that we do not monitor gas flux or composition in real time, and that there are many topics that earth scientists still do not understand.

Our letter was painstakingly analyzed by many in their group, some of whom still accused us of obfuscation and evasion. We soon noted, however, a significant curtailment in their



USGS volunteers Cathy Janik and Fraser Goff sample the gas from a fumarole on the flank of Steamboat Geyser.

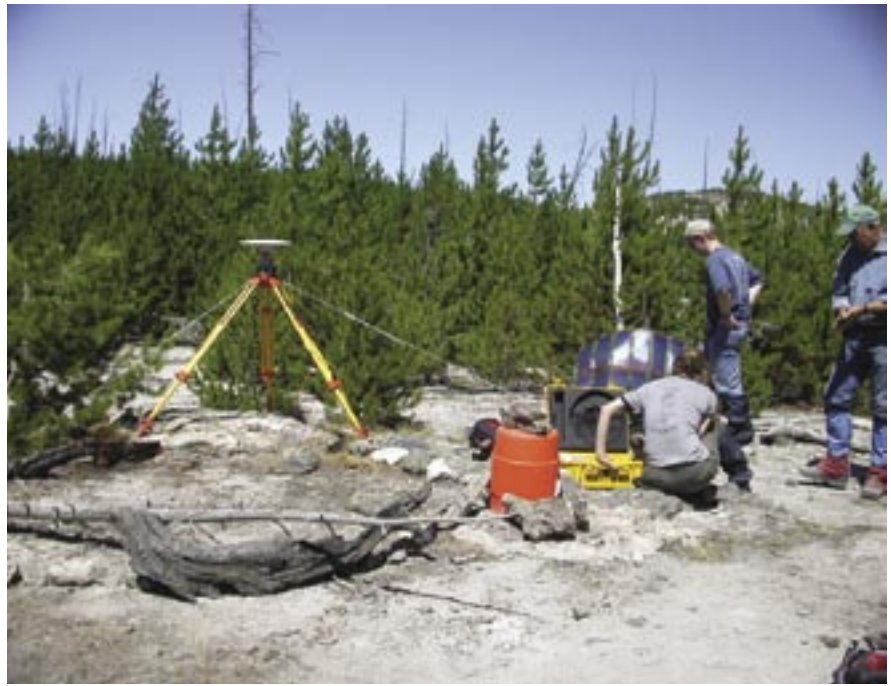
concern—messages to their Yellowstone chat room slowed to a near halt. Overall, I think we gave them what they needed, and we turned a few skeptics into grudging admirers.

Observations and Lessons Learned

My experiences over the past few years have necessarily caused me to reflect on the public face of science, scientific information, and scientists themselves. Prior to my role at YVO, I’d worked as a full-time researcher on the geochemistry of magmas and their related hydrothermal systems. I recognized that although my research was relevant to volcanology and economic geology, it explored subjects too arcane to be of much interest to the public. My focus was toward other scientists, and when reporters did venture near my door, I was challenged to convey properly the significance of my work while keeping things simple, technically accurate, and appropriately reflective of work done by others.

So it came as a bit of a shock when regardless of anything I’d actually done as a research scientist, I was now solidly in the role as the point person for a whole host of critical questions. Will it erupt? Why not? When? How do we know? It’s been a fascinating transition—one that was not necessarily desired, but that has taught me useful lessons in communicating technical information to a public that truly cares about what scientists say and how we say it. These lessons hold true for people dealing with media in any profession, not just the earth sciences.

YVO coordinating scientist Bob Smith (far right) and his University of Utah and University Navstar Consortium crew install a temporary GPS ground-deformation monitoring station in the Norris Geyser Basin during the “Norris disturbance” of August 2003.



NPS/HENRY HEASLER

The first lesson is not to talk about a sensitive subject unless you’ve thought about it before, talked about it with others, and gotten some feedback. Fortunately, at YVO we have three coordinating scientists with varied expertise and different home institutions, so we have natural checks and balances when we communicate to the public. We’ve

New York Times or nightly news hours. When we get too casual or enthusiastic, our words come back to haunt us. Our excitement about understanding earthquakes, volcanoes, hurricanes, and floods can be misinterpreted. Reporters may confuse our reconstruction of past events with a prediction of future events. Ultimately, the latter holds their interest.

Read the original *Geotimes* story online at www.geotimes.org.

When the science is ignored, or misunderstood, everyone loses.

learned that it’s critical to keep things as simple as possible. If you’re trying to answer a question, do not give an answer that will spark two more questions. And though there may be 10 different possible ways to answer a technical question, there’s always one that is a bit more direct and more intuitively satisfying, and that’s the one you should use.

Second, tell the truth and admit when you don’t know something. If you tell the truth as you see it, many will still call you a baldfaced liar. If you choose to hide anything, they’ll *know* you are one.

And last, don’t confuse enthusiasm with good outreach: It may work for high school kids but it won’t work with the

In the end, the reporters and filmmakers have the final say. They write the articles and scripts, they choose the quotes and sound bites, and they have the attention of the public. When they work hard to get the facts correct, it pays off. The *Supervolcano* drama was successful in large part because it was authentic, making the plot more gripping and the whole experience more educational. When the science is ignored, or misunderstood, everyone loses. The challenge for us scientists is to relay both the details and the context of our work, so that society understands that science is ultimately a human endeavor—sometimes uncertain, often complex, but always exciting.



USGS/MIKE DIGGLES

Jake Lowenstern is scientist-in-charge for the Yellowstone Volcano Observatory and is based at the U.S. Geological Survey (USGS) in Menlo Park, California. The observatory is a partnership between Yellowstone National Park, the USGS and its Volcano Hazards Program, and the University of Utah, which operates the earthquake and ground-deformation monitoring networks.

YS

Luxury in the Wilderness

Yellowstone's Grand Canyon Hotel, 1911–1960

Tamsen Emerson Hert



YNP PHOTO ARCHIVES, YELL. #17

Through a blinding blizzard with the wind blowing a horizontal gale of thirty miles an hour, over thirty-seven miles of almost trackless snow four feet on the level, through mountain gorges where the drift lay packed from ten to twenty feet, across frozen creeks and rivers, I had come in a horse-drawn sleigh to the brink of the Grand Canyon of the Yellowstone River in the National Park to witness the Titanic winter work of building a new half-million dollar hotel that was to be ready for the summer tourist by June.

—John H. Raftery, *The Story of the Yellowstone*¹

SO WROTE JOHN H. RAFTERY, editor of the Butte, Montana, *Treasure State*, recalling his January 1911 trip to the construction site of a hotel near the falls of the Yellowstone. Howard H. Hays, General Agent of the Wylie Camping Company, also journeyed to the site, on skis, in February 1911. In an article published later that summer, he wrote: “Hard by the canyon rim the vast substantial outlines of the new hotel dominate the northerly landscape. I believe I am safe in putting it down that this is the largest resort hotel between New Jersey and California.”² Other hostelries served the tourists near the falls between 1883 and 1911, but they left much to be desired.

The Grand Canyon of the Yellowstone, noted for its sublime beauty and majestic Lower Falls, has attracted visitors since its discovery by Euro-American explorers. Photographer William Henry Jackson and painter Thomas Moran provided some of the first images of this enchanting region following their tour with the Hayden Expedition. As early as August 1871, before the Hayden party exited the area, the first tourists to venture into the “Infernal Regions” visited the Grand Canyon of the Yellowstone on their return to Virginia City, Montana. While Calvin Clawson, organizer of the tour, recorded little of his impressions of the canyon or the falls, he did note that his party left their guide, Gilman Sawtell, and photographer

Augustus F. Thrasher at the canyon to spend a couple of weeks photographing the area.³ With the establishment of Yellowstone as a national park in March 1872, interest in the region blossomed.

Early superintendents of Yellowstone commented on the need for accommodations within park boundaries. In 1874, Nathaniel Langford “urged Congress to award an immediate appropriation for the park’s protection.” He cited the need for “‘commodious public houses’ at the Falls, Yellowstone Lake, Mammoth Hot Springs, and in each of the geyser areas.”⁴ In 1877, Langford’s successor, Philetus W. Norris, “called upon... Secretary of the Interior Carl Schurz to provide leases for hotel development at the falls of the Yellowstone River, Yellowstone Lake, [and] Firehole geyser basins.”⁵ Despite these recommendations, it would be several years before lodging would be available for the touring public.

Until 1883, travel to Yellowstone National Park was difficult. In that year, the Northern Pacific Railroad not only completed its transcontinental route, but also extended a branch line from Livingston to Cinnabar, Montana. With the rails extending close to the park entrance, it was even more necessary to address the need for accommodations. In December 1882, the Yellowstone National Park Improvement Company (YNPIC), a syndicate of wealthy men with connections to the Northern Pacific, received a lease for accommodations at various spots around the park.⁶ A tent hotel was erected at the Grand Canyon and began operating for the 1883 season. To advertise the availability of accommodations in the park, Rufus Hatch, an investor in the YNPIC, ran a promotional tour for newspaper reporters. A reporter from the *London Times*,

“The one terrible drawback to the enjoyment of life at the Yellowstone Falls (after the food, which was absolutely uneatable) was the enormous size and maddening persistence of the mosquitoes.”

describing the area of the Upper Falls, wrote: “A short distance above this fall is the camping-ground and ‘canvas-hotel,’ the tents being prettily situated on two sides of a street, with a large dining-tent as the central point. This is the best kept of all these stopping places, and is the most comfortably appointed for the ‘roughing’ process that the park tour requires.”⁷

Charles Gibson assumed the presidency of the Yellowstone Park Association (YPA, successor to the YNPIC) in 1886.⁸ Under his guidance the company focused its attention on building the much-needed tourist facilities. Acting Superintendent Moses Harris noted in his annual report that Gibson was granted permission “to erect a temporary building to be used for hotel purposes at the Grand Cañon of the Yellowstone, with the understanding that it should be removed on or before the 1st day of August, 1886. This building has not yet been removed, nor has the erection of the permanent building at that point been commenced.”⁹ Captain Harris again remarked on the YPA hotels in his 1887 report. He considered the accommodations around the park to be

adequate, but alluded to the temporary establishments, most likely the one at the Grand Canyon: “A domicile in tents at an altitude of 7,000 or 8,000 feet, where heavy frosts prevail every night, can, by no stretch of the imagination, be made to appear comfortable. It may, as a novelty, be endured for one or two nights, but at the end of that period the average summer visitor prefers to seek a lower altitude and the comforts of a good hotel.”¹⁰

One of the visitors to Yellowstone in 1886 was E. Catherine Bates. Her comments regarding the facilities in the Canyon area supported the concerns stated by Superintendent Harris: “We reached the Falls Inn, a most primitive little house, at four o’clock in the afternoon, very hot, very tired, and very dusty, and had much difficulty in getting rooms, as the accommodation is limited... The one terrible drawback to the enjoyment of life at the Yellowstone Falls (after the food, which was absolutely uneatable) was the enormous size and maddening persistence of the mosquitoes.”¹¹

By 1888, Superintendent Harris was completely frustrated with the hotel operation of the YPA, though Charles Gibson had followed through on a few of the terms outlined in the lease. Of particular note was the continued delay in constructing a permanent hotel at the Grand Canyon. Once again, Harris provided specific examples regarding the inadequacy of the facilities: “The building at the Norris Geyser Basin is a long and narrow one-story building built of 1 inch pine boards. It has some twenty small sleeping-rooms, is cold and open, with no appliance for heating beyond a sheet iron stove



YNP PHOTO ARCHIVES, YELL #3776

H.F. “Uncle Tom” Richardson, guide at Canyon, with two private concessioner tour guides. Sign on tent reads “YNP Wylie Permanent Camp.” Photo circa 1890.

in the common hall. At the Grand Cañon there is a similar structure, heated in the same manner, but the roof, which is of some patent material, is leaky. The building is located in thick timber where the sun seldom penetrates, and is always cold and damp. Visitors who pass the night at this place are fortunate if they escape sickness from severe colds.”¹² F.A. Boutelle, Harris’s successor, commented in a supplemental report that the hotel at the Grand Canyon would be completed during the 1889 season.¹³

The *Superintendent’s Report* for 1890 contained an update on the condition of the facilities at Canyon: “The association has thrown enough money in the direction of the Grand Cañon to erect and complete a fine hotel building, but through very bad management it is still in an unfinished condition, and through bad taste will, when completed, be an unsightly affair. When a new foundation is placed under it, it will, however, be a very comfortable and commodious house.”¹⁴ A letter from Charles Gibson to Superintendent George S. Anderson dated July 10, 1893, revealed that the delay was related to the YPA’s desire to build the hotel at a site down the hill and to the east of the one that was ultimately chosen, so that tourists might



NPN PHOTO ARCHIVES, YELL. #147588

The second Grand Canyon Hotel, circa 1890.

walk to the canyon. In fact, the company refused to build on the eventual site for three years, and by the time construction began, the building materials had started to decay.¹⁵

The YPA opened the permanent building, referred to as the second Cañon Hotel, in 1890. Several Haynes postcards depict this three-story frame hotel located on the hillside above the Lower Falls of the Yellowstone. In 1892, Jacob Frick described this hotel as “the largest and best appointed in the Park.”¹⁶ However, according to Aubrey Haines, the foundation for this 250-room structure was found to be insecure even before it was completed. By 1896, the interior of the hotel required replastering.

Due to complicated financing and dealings with the Department of the Interior, Charles Gibson turned over his shares of the YPA to the Northern Pacific Railroad on April 25, 1898. These shares were then purchased by Harry W. Child and his partners. Under Child’s oversight, the hotel concession grew prosperous. In 1901, an additional 24 rooms were added to the Canyon Hotel, and at the same time, extensive repairs were again made to the foundation.¹⁷

Even with an addition, the facility was too small to accommodate the increasing number of visitors to Geyserland—at least at the height of the season. In the early summer of 1908, Will Rogers sent a letter with this message: “...stayed the night at the big Canyon Hotel the first and only guest. I had the whole hotel to myself. They even had the orchestra to play while I was in a dining room. [That] night all kinds of big game were playing around out on a big level place.”¹⁸

The 1909 edition of *Campbell’s Complete Guide and Descriptive Book of the Yellowstone* provided this description of the second Canyon Hotel: “The Cañon Hotel...is set upon a hill...so high...that the red roof may be seen from ten miles up the road as you come down from the Lake, [with]...no intervening trees to obstruct the view. The Cañon [Hotel] can make no claims to architectural beauty but what it lacks in that is made up amply when you look from its windows or its veranda over the grandly beautiful landscape of mountains and meadows with only a white fleck of the foaming water of the Upper Falls dotted in. The comforts within are in keeping with the excellence of all the others of the Park, and who dines



NPN MUSEUM COLLECTION, YELL. #13689

Haynes double oval postcard showing the second Grand Canyon Hotel.



A Robert Reamer drawing of the proposed Canyon Hotel, built in 1910.

at the Cañon dines well, and on the Cañons beds the sleep of the just come[s] with no troubled dreams.”¹⁹

Harry Child was committed to building new hotels that held appeal for wealthy travelers. In 1904, the Old Faithful Inn, financed by the Northern Pacific Railroad and designed by architect Robert C. Reamer, opened at the Upper Geyser Basin.²⁰ With the success of the Old Faithful Inn, Child turned his attention to the facility at the Grand Canyon. He asked Reamer to design yet another addition for the Canyon Hotel. In 1910, an article in the *Livingston (MT) Enterprise*



YNP PHOTO ARCHIVES, TELL #89281-48

Robert Reamer (left) with his foreman during the building of the Canyon Hotel.

“In the planning and building of the new Canyon Hotel, Architect Robert C. Reamer has surpassed even the triumph which he achieved in the famous Old Faithful Inn.”

described Child’s plan: “Mr. Child made announcement today of comprehensive plans which will make the hotels in the park among the very finest in the country. June 1 ground will be broken for the construction of the new Canyon Hotel at the Grand Canyon. Plans for the structure were prepared by R.C. Reamer...recognized as one of the foremost designers in the country, and one who has struck out boldly on original lines, evolving an architectural style which is strikingly effective, completely in harmony with the surroundings and withal is distinctly American.”²¹

The Department of the Interior approved Reamer’s plans for the Canyon Hotel addition on May 2, 1910.²² Construction commenced in the fall and continued through the winter. A scrapbook in the Yellowstone photo archives documents the progress of the construction. It is evident from the photos that Reamer’s addition was immense. Also evident is the way

Reamer incorporated the original structure into the design of the new building.

At the end of the 1910 tourist season, work on the new structure was well underway. Harry Child did not remain in the park to oversee the project. The Livingston, Montana, *Daily Enterprise* (the name of this newspaper alternated during the time period discussed in this article) reported on October 5 that Child had departed for Helena and, following several weeks at home, he and Mrs. Child would travel abroad. An additional note in the story suggested that part of the trip would be business: “In the east he will purchase the furnishings for the new Canyon hotel in the Park, which will be the most unique in the world when complete.”²³ One of the stops Harry and Adelaide Child may have made was to Joseph P. McHugh’s “Popular Shop” in New York City. McHugh prided himself on providing unique items for the upper class.

Everyone was interested in the new hotel at the Grand Canyon of the Yellowstone, and several individuals described the construction after witnessing it for themselves. One such person was Dan W. “Red” Gibson, who recorded the story of the construction in poetic form in his *Souvenir of Construction of the New Canyon Hotel*. Part of his work read:

*Let’s inspect this great, surprising
Edifice which is arising
Mid the somber solitudes
Of the Rocky Mountain Woods.
First, we note its outlines are
Broken and irregular.
There is endless variation.
There are walls that twist about
As though more or less in doubt
As to destination.*²⁴

As noted earlier, both John H. Raftery and Howard H. Hays ventured to the construction site in the heart of a Yellowstone winter to see for themselves the building of this hostelry. Citing a report from the *Treasure State*, (probably written by Raftery), the Livingston *Daily Enterprise* again apprised its readers of the progress of the new structure: “In the planning and building of the new Canyon Hotel, Architect Robert C. Reamer has surpassed even the triumph which he achieved in



Y.N.P. MUSEUM COLLECTION, YELL. #50114

Tammen postcard of the completed Canyon Hotel, 1913.

the famous Old Faithful Inn. That gigantic rustic structure always looked to me as though it had grown out of the world-old ground where it stands an everlasting monument to the genius and ingenuity of Architect Reamer who contrived and created it.”

The article also complimented Harry Child on his improvements in Yellowstone: “Every improvement in the Park devised or authorized by Mr. Child has been in harmony with its surroundings, a visual adornment to the landscape, a new note of unobtrusive and yet contributory beauty to a region so nobly magnificent in itself that, as Architect Reamer puts it: ‘The grandest building that man could put in it almost seems like an impertinence.’ President Child feels and acts in the same way, and that is why every structure that is added to the Park equipment by the company must be a thing of beauty as well of utility.”²⁵ John H. Raftery went on to publish a pamphlet, *A Miracle in Hotel Building*, that described, in depth, the construction of the hotel through the winter of 1910–11, as well as the architectural details of the new building.²⁶

In 1904, the opening of the Old Faithful Inn had passed with little or no fanfare given to either its construction or its actual opening. Researchers have found few newspaper articles or brochures from 1904 announcing the opening of Reamer’s famed rustic inn. However, in 1911, Harry Child and others connected to park operations promoted the new Canyon Hotel and its architectural features.

The Northern Pacific Railway issued a broadside (a sheet printed on one or both sides and folded for mailing) in 1911, “When Summer Comes.”²⁷ Much of the information found in this publication formed the basis for the article, “A Monster New Hotel in Yellowstone, Vies With the Famous Hostleries of the Country,” printed in the *Livingston Enterprise*.²⁸ In addition, postcards with an architectural rendering of the new hotel were distributed. One card advertised the Pittsburgh Plate Glass Company and the other was stamped with the trademark for the McHughwillow Furniture Company of New York, which produced willow furniture for use in the hotel. The reverse of the McHughwillow card read: “A leading trade journal tells of



Y.N.P. PHOTO ARCHIVES, YELL. #89282-4

Construction of the Grand Canyon Hotel, fall 1910.



POSTCARD COURTESY WILLIAM W. ABBOTT



Promotional postcard distributed by the McHughwillow company, which produced the hotel’s furnishings.

an order for 1,500 pieces of this famous furniture for the New Canyon Hotel Yellowstone Park, which opens June 15, 1911. Every piece is specially designed for the room and space it is to occupy and of course the 1,500 pieces are made to order. Three carloads have already gone forward, comprising only a part of what is probably the largest order of its kind ever booked.”²⁹

In the October 1911 issue of *The Hotel Monthly*, the new Canyon Hotel was regarded as “an architectural creation that stamps it a veritable wonder in Wonderland.”³⁰ In the article, Reamer provided some insight into the design of his building: “We try to feature all our hotels with something to remember. The president of the company and myself traveled over America and Europe to get ideas adaptable to hotel conditions in the park. Here, as you know, we have unusual conditions; the arrivals coming all at once each day, and the departures the same, and our arrangements must be to accommodate this condition. Then we must have our hotels...at all times, and in particular of inclement weather, to be particularly attractive in the public rooms, as well as the bed rooms. We noticed in our travels that a very large proportion of the resort hotels had their public rooms divided, or segregated, special rooms for this or that purpose; and we noticed also that a majority of

these rooms were very little used, that one particular room was favored; and for this reason the lounge in the Grand Canyon Hotel was designed as the gathering place for all.”³¹

The new Grand Canyon Hotel, as it was known, while not entirely completed, opened for the season June 15, 1911. The formal opening was held August 2. Mr. and Mrs. Harry W. Child presided over a reception and ball held there, and the lounge was opened for the first time for the occasion.³² John H. Raftery again supplied a detailed description of all the features of this remarkable building. His words, as well as those of countless other visitors, coupled with the Haynes 100 Series postcards, provided the interior details of this magnificent building.

The stop at the Grand Canyon of the Yellowstone was usually the final one for visitors making the Grand Loop tour. William Myall gave this description of his arrival at the hotel: “The approach to it from the driveway is quite picturesque and adds much to the general beauty of the building. The hotel is on the hill. The driveway is down the hill some hundreds of feet away. A beautiful covered way fully twenty-five feet wide runs down the hill from the hotel to the road, ending in a picturesque porte-cochere.”³³ Travelers arriving at the hotel would



YNP PHOTO ARCHIVES, YELL #108237

Monida & Yellowstone-Western Stage Company stagecoaches arriving at the Canyon Hotel porte-cochere in 1914.



Y.N.P. PHOTO ARCHIVES, YELL. #114981

An aerial view of the Grand Canyon Hotel, said to be one mile around, circa 1940.

by a “generous sprinkling” of wicker. Upon entering, guests found the registration desk straight ahead from the main entrance doors. To the right, a short set of stairs led to the dining room. Just past the registration desk was a spiral stairway leading to the guest rooms on the upper floors. Also in the lobby were “two hydraulic passenger elevators, a freight elevator, telegraph and livery offices, cigar and news stand, and a profusion of writing desks.”³⁵

The lounge was the hotel’s dominant feature. It was 175 feet long × 80 feet wide × 45 feet high, “without pillar or post to mar the view.” The floor was of polished oak and the walls and ceiling were of red birch, matching the lobby. Massive alternating pillars around the perimeter sustained the broad, high roof. French plate glass windows surrounded the room

disembark from their stages at the porte-cochere, and ascend through the covered walkway to the hotel lobby on foot.

Myall continued with details of the entrance incline: “The ascent to the hotel is made by a series of short stairways from one level to another, and the roof following the contour of the floor also rises in the same broken levels supported on entablatures which rest on handsome columns on either side. Along each side a heavy balustrade follows the contour of the floor and steps, and throughout the whole length on each side are seats along the balustrades which are much used by the guests.”³⁴ After strolling up the entrance, tourists entered the lobby. As they made their way up the incline, their luggage was wheeled away, up an out-of-sight ingress located beneath the incline they followed, to be delivered to the hotel office.

The lobby, 118 × 65 feet, was finished in red birch and furnished with leather-upholstered red oak, accompanied

“so that from every side, except toward the lobby, there is [an] unobstructed view of the park and surrounding forest.” The *Hotel Monthly* again quoted Reamer on the description of this gathering place: “You will observe that the furniture is mostly high backed so that patrons who may be sensitive or self-conscious can move about the room without being conspicuous.



Y.N.P. MUSEUM COLLECTION, YELL. #13713

Visitors waiting at the hotel’s entrance incline.

Then there are ingle-nooks and galleries, the hearth fire in the big hall fireplace, writing tables, tea rooms, card tables, sun parlor, window seats, choice places for every one. Then we made the room as attractive as we could, with the red birch finish, with music gallery, with rich carpet and luxurious seats, with screen; with the scheme of illumination by mammoth art glass lanterns thru which 2,000 lights are filtered.”³⁶

Many guests commented on this impressive architectural achievement. Sarah Blanche Wrenn of Salem, Oregon, toured the park in 1911, and in a letter recalled that her favorite part of the trip was the Grand Canyon: “Grand, indeed it is, and

everything about it is grand, even the hotel, which is very wonderful, very beautiful and very luxurious. It cost a million dollars and was built within a year...The great lounge, of noble dimensions, with gothic pillars and rafters, mellowed lights, [and] artistic furnishings, is a thing of beauty and joy forever. We were there from Sunday morning until Tuesday morning, and so had the pleasure of hearing from a far corner of this wonderful room a most excellent Sunday evening concert. The entrance from the lobby to the lounge is by a grand stairway, occupying the entire end, which halfway down separates, allowing space for the orchestra, and again unites,



POSTCARDS THIS SPREAD COURTESY RUTH QUINN

Canyon Hotel lobby.



Canyon Hotel dining room.



Canyon Hotel lounge staircase, circa 1911.



Lounge from the lobby at the top of the staircase.



Lounge facing toward the staircase and lobby.



The lounge hearth fire was a cozy gathering place.

creating a most imposing effect. The wearer of hobble³⁷ skirts feels anything but comfortable during her conspicuous entering and exiting.”³⁸

In a 1998 conversation, Marion Sanger and Betty Pomeroy, granddaughters of Harry W. Child, each recalled that they always dreamed of being married in the Grand Canyon Hotel and making their entrance down the grand stairway to the lounge, but neither was married there.³⁹ In addition to the features described by the architect, there were two spiral staircases about midway in the lounge. These led to balconies overlooking the central portion of the room.

The dining room was equally impressive. It measured 175 × 60 feet, and had a bay annex 50 feet in diameter. Also finished in red birch, the columns were uniquely designed with branches at their tops, resembling pine trees with tangled limbs. The windows were decorated with an artistic design thought to resemble pine needles. The *Hotel Monthly* stated: “The lighting is by indirect method, the lights shielded from view in hanging baskets, and reflected from the ceiling furnishing a delightfully soft and pleasing illumination.” Limbert supplied the dining

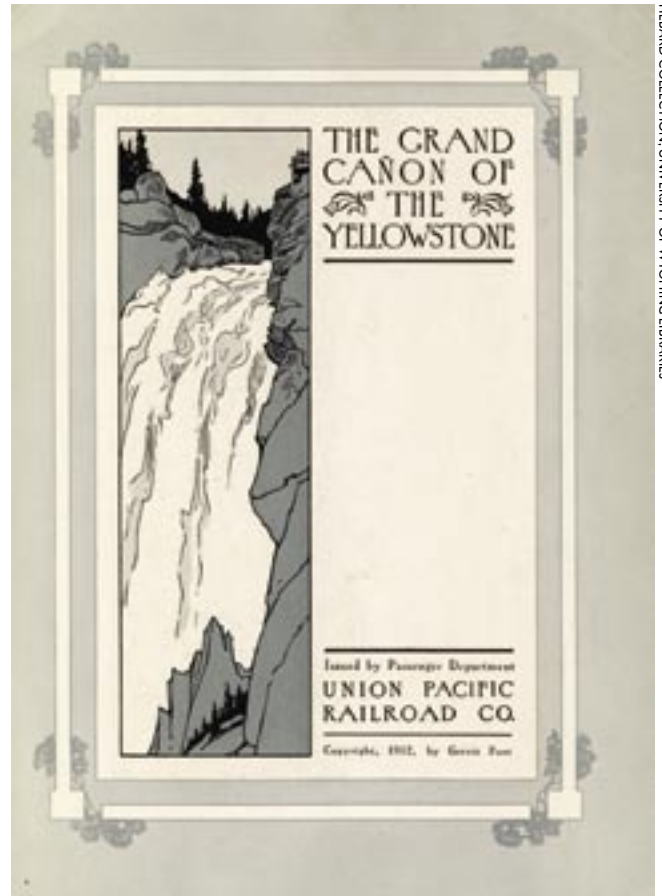
room furniture. Today, some of these pieces can be found in the back of the Old Faithful Inn dining room.⁴⁰

Promotion of the new hotel continued in 1912 and 1913. The Union Pacific Railroad, which had a terminus in West Yellowstone, Montana, issued a brochure, “The Grand Cañon of the Yellowstone” for the 1912 season. In addition to describing the grandeur of the canyon itself, the authors wrote: “If the Grand Cañon of the Yellowstone is one of the crowning works of Nature, so is the Grand Cañon Hotel, set out here many long miles from railway transportation, one of the crowning works of man. For here, where bear and elk and deer roam at will, where the face of Nature has not been changed by human hands, where the wild noises of the forest are heard at night, has been built one of the magnificent public houses of the world.”⁴¹

John H. Raftery’s *The Story of the Yellowstone* was also published that year. In October 1912, *Western Architect* published an article on the Grand Canyon Hotel that included its floor plans. Popular magazines ran full-page ads for the Northern Pacific Railroad’s Yellowstone Park Line, touting the new hotel. In December 1912, such an ad appeared in *Country Life in America*.⁴² The caption read: “Five up-to-date hotels, including the rustic Old Faithful Inn, and for this season the magnificent new Grand Canyon Hotel, outdoing the most famous resort



A postcard depicting a spiral staircase in the Grand Canyon Hotel.



Title page of the Union Pacific Railroad’s booklet, *The Grand Cañon of the Yellowstone*, 1912.

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places in its superb location, complete appointments and service.”

Transportation to the Grand Canyon Hotel was by stagecoach until 1915. That year, personal “pleasure vehicles” were admitted to the park beginning August 1. This was due, in part, to the increased use of personal automobiles and the improvement of the nation’s road system.⁴³ Harry Child was known to drive his personal vehicle from his winter home in Helena, Montana, to his summer home in the park, leaving the car at the garage located at the North Entrance arch. Additional pressure came from the push to create a park-to-park highway between Yellowstone and Glacier. When Glacier National Park was established in 1911, automobiles were permitted entry.⁴⁴ During 1916 *only*, both stages and touring buses were allowed to make the Grand Loop Tour. By 1917 it was apparent that this joint operation was not working. The transportation companies, including Harry Child’s Yellowstone Park Transportation Company, shifted from stagecoaches to touring buses. Purchased from the White Motor Company, these “buses” were specially designed for Yellowstone.⁴⁵ “Automobile camps” were established in several areas of the park to accommodate

those who wished to “rough it.”

A variety of activities were available for the guests. Visitors could hire transportation to take them to the Grand Canyon of the Yellowstone or to Mount Washburn, or they could drive their own vehicles along the canyon and walk to the brinks of the Upper and Lower Falls. Musical entertainment was a long tradition in both the second and “new” hotels. In the 1930s, Gene Quaw and his Canyon Hotel Orchestra provided entertainment in the lounge. A program from 1938 listed a variety of music from DeKoven, Rimsky-Korsakov, and Tchaikovsky. Gene Quaw would end the evening playing his own piece, *Yellowstone*. Other options included visiting the Canyon Art Shop, writing postcards, or viewing a performance of the Canyon Hotel Follies.

Dancing was listed in a number of park brochures as a nightly activity. In August 1921, former Wyoming Senator Jacob M. Schwoob escorted a group through the park. One member of the group prepared a trip log that described an evening at the Grand Canyon Hotel: “We had a very lovely dinner and we thoroughly enjoyed it...After dinner we sat around in the hotel lounge writing the inevitable post cards and watching

the crowds. Meantime the orchestra were tuning up and J.M. [Schwoob] beg[an] scouting around for dance partners...Governor [Robert D.] Carey and his party were registered...J.M. had several dances with both Mrs. Carey and Mrs. Cunningham.”⁴⁶

On only a few occasions were the park’s hotels closed. Both world wars resulted in all hotels being closed in 1918, and again from 1943 to 1944. During World War II, many park facilities fell into disrepair. With no money coming in, it was difficult to justify expenditures on improvements. When the war ended, there was an explosion in tourism across the country. The park began to see the result of years of promotion, only to be unprepared for the onslaught of visitors. Yellowstone’s facilities no longer met the needs of the traveling public; campgrounds, lodges, and hotels all required improvements by the 1950s.

The 1950s represented a decade of transition for the



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A Northern Pacific Railroad brochure promoting the Canyon area, 1913.

National Park Service (NPS) and its concessioners. In 1951, Conrad Wirth was appointed NPS director. In January 1956, responding to concerns about park facilities, he proposed a multi-million dollar program, Mission 66, intended to improve visitor services in all national parks by 1966. Congress approved and funded the program, and Yellowstone was the first park to begin implementing his vision. The plan was to increase overnight accommodations from 8,500 to 14,500. The construction of Canyon Village was the first step in this program.⁴⁷

Through the years, the Yellowstone Park Company (YPC) had borrowed heavily from the Northern Pacific Railway.⁴⁸ By 1955, this loan was finally paid off. This left the YPC in a poor spot to respond to Wirth's Mission 66 program, which required an investment of \$15 million from the company. The YPC "was simply in no position to support the planned Canyon Village development, not to mention the upgrading of existing buildings."⁴⁹ Despite the company's concerns, plans for Canyon Village continued.

Groundbreaking for the new area was held June 25, 1956. While the Canyon Hotel remained open, the plan for the new "Village" required the dismantling of the Canyon Lodge and cabins across the Yellowstone River from the hotel. This, coupled with the remodeling of both the Old Faithful Inn and the Old Faithful Lodge, caused a severe shortage of accommodations. On top of that, portions of the Canyon Hotel were closed—a result of structural failure due to the instability of the foundation.⁵⁰

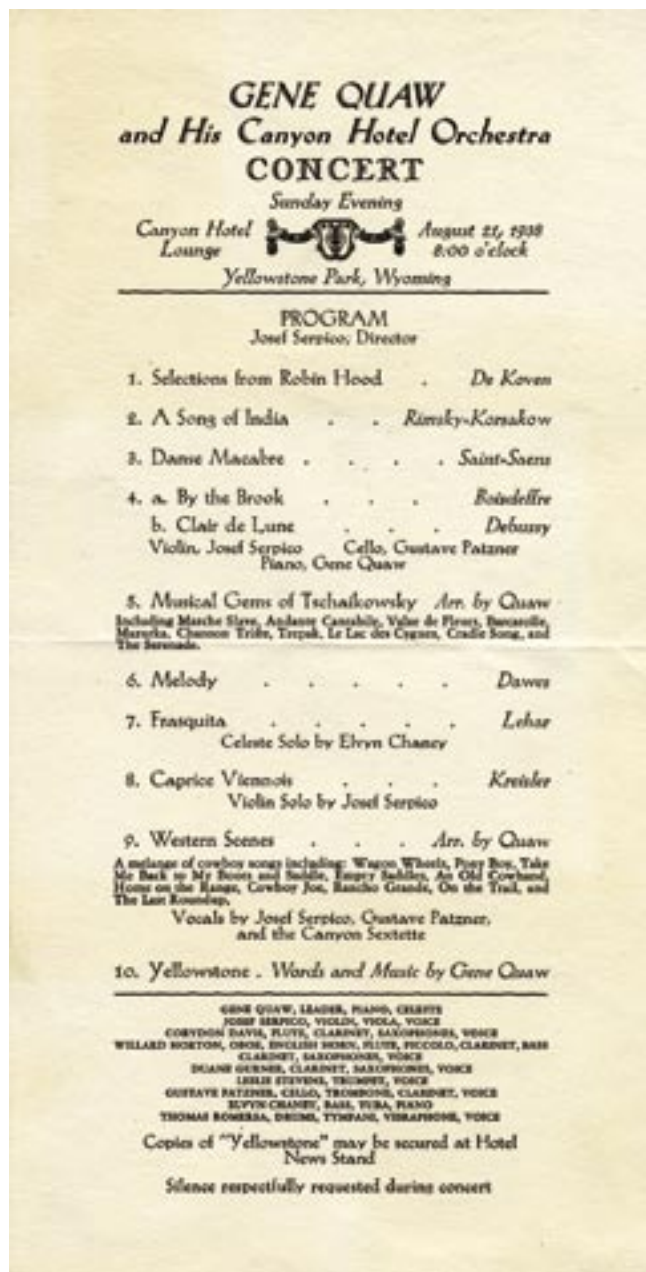
The new Canyon Village was scheduled to open July 1, 1957, but only 117 of the planned 500 cabins were completed. Betty Jane Child, widow of Huntley Child, Jr. (Executive Vice President of the YPC and son of Harry Child), recalled that some of the difficulties with the construction of the new "village" were related to NPS requirements designed to protect the park's environmental integrity. One morning at Mammoth Hot Springs in July 1998, the sound of trash trucks gearing down as they headed up into the park made her recall that



NPS PHOTO ARCHIVES, YELL #133905

Orchestras at the Canyon Hotel delighted dancers in the hotel lounge.

the YPC had not been allowed to haul gravel from the Sylvan Pass area to Canyon Village. Rather, the company had to bring gravel from Livingston, Montana—a farther distance. When Huntley Child heard the gravel trucks heading up the Mammoth-to-Norris road, he would say, "Fifty dollars, there goes another fifty dollars."⁵¹ Despite the delays, the new Canyon Lodge was ready, but according to historian Mark Barringer: "Instead of being greeted by the familiar, elegant, but rough-hewn visage of the old Canyon Hotel, visitors discovered a concrete-block-and-glass edifice boasting orange Formica tables. Upon seeing the new facilities, many preferred to stay in the more expensive hotel, whose occupancy rate rose for the first time in years."⁵²



YPC MUSEUM COLLECTION, YELL #1592

Canyon Hotel concert program for Gene Quaw and his orchestra.



A dining room menu from 1925.

On September 12, 1957, Thomas Hallin, manager of the Construction Department, sent a letter to Yellowstone Superintendent Lemuel A. Garrison stating that reconstruction of the foundation beneath the porch on the east side of the Canyon Hotel Lounge had commenced. He described the damage: "Due to the frost susceptibility of the soil surrounding this portion of the Canyon Hotel Lounge, the existing foundations have been badly broken by frost action. The front of the porch has raised approximately 1 foot, and the north wall has been displaced inward approximately 10 inches. As a result of this pressure, the main structure of the lounge has been put under severe strain and a number of the supporting columns and trusses have been distorted. This condition has been observed for several years, but it has now reached a point where repairs

are absolutely necessary."⁵³ Despite the damage, the Canyon Hotel opened on June 16, 1958.⁵⁴ Little did anyone know that this would be the final season for the grand old lady.

An inspection of the hotel conducted September 13, 1958, included NPS engineers, Huntley Child, Jr., and construction department manager Thomas Hallin representing the Yellowstone Park Company. The purpose of this inspection was to "ascertain the feasibility of continued use of this structure." A memo dated January 16, 1959, from Park Engineer Gerald Rowe to Superintendent Garrison related the findings of the inspection. It was apparent that the structure had been wracked for nearly 50 years by heavy snow loads coupled with frost upheaval and ice pressures. The YPC had "hired an architectural firm to make a structural analysis of the building to determine the relative merits of continuing to operate" the hotel, "with the increasing maintenance costs plus a large rehabilitation cost necessary to prevent possible complete collapse of certain walls." Rowe continued, "It has been determined by the architectural firm of Orr Pickering and Associates that as a result of their study of the structure, they were of the opinion that it was not economically feasible to rehabilitate the building and that it should be abandoned."⁵⁵

Early in 1959, Superintendent Garrison issued a press release announcing the closing of the Canyon Hotel. On April 11 the *Livingston Enterprise* printed a story in which Huntley Child, Jr., announced the YPC's plans for the hotel: "Child told the group it will be around August 1 before the company can give definite answers as to when the Canyon Hotel will be torn down and when a contract for the new building to replace the structure can be let...Child said the loss of accommodations caused by the elimination of Canyon Hotel will be offset this season with the opening of 87 additional rooms and the new dining room at Lake Lodge and completion of all facilities at new Canyon Village."⁵⁶

In May 1959, park officials and Huntley Child, Jr., met with members of the Cody Club. The *Cody (WY) Enterprise*



The structural failure in the roof trusses of the Canyon Hotel lobby was caused by foundation problems.

story on this meeting contained just a small line about the Canyon Hotel. Child told the group of the recent activity at Canyon Village and then stated, “bids will soon be taken on tearing down the old Canyon Hotel which is on shifting ground and has been ruled unsafe.”⁵⁷ On July 23, 1959, it was officially announced that the Canyon Hotel would be razed. As reported in the *Cody Enterprise*: “The Yellowstone Park Company announced today that the world-renowned Grand Canyon Hotel which the Company has operated for some fifty years, is to be razed. The remarkable old building, possibly the largest frame structure in the West, was for many years the most spectacular of all resort hotels. It is particularly famous for its beautiful lounge which was designed by Robert C. Reamer in 1910...John Q. Nichols, president of the Yellowstone Park Co., has indicated that an impartial survey of the building reports a considerable amount of salvage value. The Yellowstone Park Company is opening the building for all parties who will be interested in presenting a bid for the demolition and salvage of the building and associated structures from August 3 through August 8. Sealed bids will be asked for on August 15 in the office of the president at Mammoth, Yellowstone Park, Wyo.”⁵⁸

The Carlos Construction Company of Cody, Wyoming, bid \$25 and was awarded the contract. Bill Henry, the company’s owner, estimated that razing the hotel would take approximately 2½ years. When word was released that Henry had won the bid, his phone began to ring. He received calls from all over with requests for doors, bridge timbers, and other hotel items.⁵⁹ The YPC retained some of the furnishings, many of which can be found in other locations around the park today.

Shortly after its closure, fixtures, equipment, and prized birch paneling were sold. Even former Wyoming Governor Milward Simpson wanted a piece of the Canyon Hotel for posterity. On April 22, 1959, he wrote to the superintendent, “Dear Friend Garrison: When I saw the piece in the paper with respect to the demolition of Canyon Hotel, I was filled with nostalgia. As a child, while I worked in Yellowstone Park, I used to

go up there occasionally. I even hopped bell there one time. There’s some beautiful wood and other things in that lovely old place, and I was wondering if there is any prospect of Lorna and me getting some of it for use in our ranch above Cody.”⁶⁰

There is no evidence in the Yellowstone Park Archives that the Simpsons obtained any Canyon Hotel fixtures. However, many individuals recall visiting the park in 1959, stopping at the hotel, and purchasing items laid out in the lounge. Quinn Blair and his wife Ruth, of Cody, Wyoming, have Canyon Hotel light fixtures adorning their Frank Lloyd Wright home (the only Wright building in Wyoming), as does the Holiday Inn in Cody. The Blairs also purchased a set of Limbert chairs from the president of the YPC for \$5 apiece at Mammoth Hot Springs. Mark Simpers of Cody worked in Yellowstone in 1959; he obtained a brass balustrade and brass door handles from a set of French doors—probably from one of



A room key from the Canyon Hotel.

YNP MUSEUM COLLECTION, YELL #5399



Canyon Hotel plate, circa 1915.

YNP, MUSEUM COLLECTION, YELL #21975.



Plaque from Canyon Hotel elevator.

YNP MUSEUM COLLECTION, YELL #51375



A light fixture from the Canyon Hotel is now affixed to the Holiday Inn in Cody, Wyoming.

TAMMSEN HERT

the porches—and one of the older windows, which he used in his garage.⁶¹

In July 1960, the *Riverton (WY) Ranger* printed a lengthy article on the razing of the Canyon Hotel: “Visitors to scenic Yellowstone National Park this summer will be dismayed that the gorgeous and historical Canyon Hotel gracing the area near the Grand Canyon of the Yellowstone River stands as gutted as a herring, awaiting the steel tentacles on boom



The Canyon Hotel, just before the fire.

trucks that shall fell it to the ground...In its place, and only a few miles away, is the newly constructed and lavish Canyon Village, which offers to the tourists motel units, shopping centers, cafeteria service or café, and bar. Yet the charming and more leisurely way of life is gone with the old hotel which served half a century as one of the most cherished resorts in the world...Much of the interior furnishings of Canyon Hotel have been sold by Mr. Henry. Especially in demand were the 2,000 brass beds and comfortable old fashioned, long bath tubs that served the rooms. One of these Mr. Henry even installed in his own home.”⁶²

On the night of August 17, 1959, the strongest earthquake in recent memory occurred in the Yellowstone region. The razing of the Canyon Hotel was lost amid news stories of survivors and devastation. It has incorrectly been assumed by some that the Canyon Hotel was closed because of structural damage caused by the earthquake; however, the hotel’s closure was the result of its foundation problems caused by its hillside placement. Had the YPC not been in financial straits due to the construction of Canyon Village, perhaps the hotel could have been saved. We will never know.

While the building was still being demolished, a fire of unknown origin occurred on August 8, 1960. The entire structure was destroyed. Michael Turner worked at the

Haynes Photo Shop at Canyon in 1960, and recalls watching the Canyon Hotel burn. He and the postmaster from Canyon were returning from Lake when they saw the fire. Earlier in the season, he had taken some photographs of the demolition of the hotel. That night, he again had his camera handy and documented the fire.⁶³ Even though a park fire truck was dispatched to the scene, all the firemen could do was prevent the fire from spreading to other buildings. The next morning, only the ruins of the once-glorious lounge remained. Newspapers

from around the region reported on the conflagration. The headlines varied: “Old Canyon Hotel Destroyed by Fire;”⁶⁴ “Monument in Park Burns Down;”⁶⁵ “Fire Destroys Abandoned Historic Yellowstone Hotel;”⁶⁶ “Colorful History to Hotel Lost in Fire August 8.”⁶⁷

According to several accounts, the fire started around 9:30 PM in one of the hotel’s wings. “Within 15 minutes, the entire wing was in flames and then the entire building, eaten away like tinder...By 4 a.m. all walls had crashed within the foundation.”⁶⁸ A touching story appeared in the *Wyoming State Tri-*

There is considerable speculation about how this fire started.



Canyon Hotel fire, 1960.

Rodd Wheaton, the NPS's former assistant intermountain regional director for cultural resources, believes that the loss of this hotel was "one of the great architectural losses in Yellowstone National Park."

bune: "The Great Lady Chose Sudden Death: The Great Lady was outraged. She could not, she would not, accept the indignity of laborious, prolonged, and piecemeal destruction. She chose sudden death. And so Canyon Hotel, the once grand edifice of Yellowstone National Park, a 950-room and superb example of luxurious living in another era, burned to the ground."⁶⁹

There is considerable speculation about how this fire started. Rumors abound. While various newspaper accounts indicated that an investigation would be conducted, no evidence of such an investigation has surfaced. By August 1960, most of the materials inside the hotel were removed, including radiators, elevators, and miles of pipes. The wooden structure remained, a shell of the formerly grand structure. According to Jack Ellis Haynes, "This 1911 structure was only partly razed, when by accident it caught fire and burned to the ground on August 8, 1960. Unfortunately the contractor had cancelled the fire insurance only a few days before the fire which destroyed a large amount of salvaged material he was in the process of removing."⁷⁰ Some residents of Cody, Wyoming, say that they knew so-and-so "who was there when the match was dropped." And so, the mystery of the Canyon Hotel fire continues.

By 1962, the site was leveled and returned to its natural state. Today, if you look closely, you can still see where the lounge stood. The site is accessible from the horse corrals; there is evidence of the old circle drive that delivered tourists to the porte cochere. Just west of that area, and south of the winter keeper's home, there is a slight rise with a group of pine trees growing there, which is very close to where the lounge was.

For nearly 50 years, the Grand Canyon Hotel housed governors, presidents, dignitaries, and thousands of guests. Most who had the opportunity to stay there enjoyed it and recalled their experiences fondly. Many consider it to be Reamer's most monumental work.⁷¹ Rodd Wheaton, the NPS's former assistant intermountain regional director for cultural resources, believes that the loss of this hotel was "one of the great architectural losses in Yellowstone National Park."⁷² It is regrettable that it was impractical to save this architectural landmark, for today it would once again be filled nightly with travelers. But those fortunate enough to have had the opportunity to stay there owe their thanks to Robert C. Reamer, who had the vision to design such a remarkable place, and Harry W. Child, whose "heart lay in the great hotels."⁷³



Tamsen Emerson Hert, (shown here wearing her 1904 walking suit) holds Master's degrees in American history and library science. She is the Wyoming bibliographer at the University of Wyoming Libraries, where she is also responsible for the Grace Raymond Hebard Collection. This article is part of a history of Yellowstone's

hotels, lodges, and camps that she is co-authoring with Lee Whittlesey, Yellowstone's historian. If you have any recollections about this hotel or other park hostleries that you would like to share, please contact Tamsen Hert at the University of Wyoming Libraries, Dept. 3334, 1000 East University Avenue, Laramie, WY 82071; (307) 766-6245; thert@uwyo.edu.

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- ³ Calvin C. Clawson, *A Ride to the Infernal Regions: Yellowstone's First Tourists*, ed. Lee Silliman (Helena, Mont.: Riverbend Pub., 2003), 98, 100.
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 - 50 Aubrey Haines. *Yellowstone Story*, vol. 2, 377 and note on 423.
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Yellowstone Elk Calf Mortality Following Wolf Restoration

Bears Remain Top Summer Predators

Shannon M. Barber, L. David Mech, and P.J. White



A vulnerable newborn elk calf is dependent on its mother for food and protection from predators.

Background

In the ten years since wolves (*Canis lupus*) were restored to Yellowstone National Park (YNP), elk (*Cervus elaphus*) numbers have substantially decreased. The northern range elk herd is the largest elk herd in Yellowstone, and constitutes the majority of the park's elk population. During 1994–2005, early winter counts of northern Yellowstone elk decreased from 19,045 to 9,545. Also, during winters 2000–2004, calf:cow ratios declined from 29:100 to 12:100, and were among the lowest recorded during the past several decades. Though many factors (e.g., predation, hunting, and drought) likely contributed to this decreasing abundance and low recruitment, several state and federal legislators continue to speculate that wolves are the primary reason for the recent decrease in elk recruitment rates, and have called for the immediate delisting and liberal control of the abundance and distribution of wolves. Because both wolves and elk are culturally, economically, and ecologically

important in the Yellowstone area, it is vital to determine the basis for the decline in the elk population. To help this effort, we initiated a three-year study of northern Yellowstone elk calf mortality in May 2003. Our study was designed to follow up on Dr. Francis Singer et al.'s baseline pre-wolf restoration elk calf mortality study (1987–1990).

The primary objectives of our study were:

- to determine relative causes and timing of elk calf deaths;
- to evaluate survival rates and recruitment of elk calves into the adult population;
- to determine nutritional condition and disease status of calves killed by wolves and other predators; and
- to evaluate the temporal and spatial variation in the proportion of calves killed by predators.

When the final results of this study are complete, they will provide managers and researchers with post-wolf restoration data and an assessment of the extent to which wolf predation is

additive or compensatory to other sources of elk calf mortality. In other words, wolves could be killing enough calves to greatly reduce the herd (additive mortality), wolf predation could be merely substituting for other mortality sources such as starvation or deaths caused by other predators (compensatory mortality), or some of each type of mortality could be occurring. A report by the National Research Council (Orians et al. 1997)

Our preliminary analysis of this study indicates that grizzly and black bears, rather than wolves, are having a greater impact on neonatal elk calf mortality than any other predator.

indicated that information regarding the extent to which wolf predation is additive to historical patterns of mortality (e.g., winter-kill, other predators) is critical for the effective management of this ecosystem in the future. Prior to the first year of our study, no information was available regarding wolf predation on Yellowstone's elk calves <5 months of age, when they are smallest and most vulnerable.

This article presents some of the study results. The final results of the project will be summarized in a Ph.D. dissertation expected to be completed by December 2006, and one or more publications in peer-reviewed scientific journals. In anticipation of those final results, however, and with delisting of both gray wolves and Yellowstone-area grizzly bears (*Ursus arctos*) on the political horizon, we feel it is important to share somewhat surprising information: our preliminary analysis of this study indicates that grizzly and black bears (*Ursus americanus*), rather than wolves, are having a greater impact on neonatal elk calf mortality than any other predator.

Bears and Elk Calves

That bears prey on Yellowstone elk calves has long been well known. For example, in 1920, park naturalist M.P. Skinner and visitor A.B. Howell saw a black bear catch an elk calf after apparently deliberately hunting through sage (Howell 1921). In his *Bears in the Yellowstone*, Skinner wrote, "as it is only two or three weeks before the little fellows [elk calves] are strong and expert enough to escape, the damage done [through bear predation] to the elk herds is not very great" (Skinner 1925). Thomas Thompson watched a grizzly sow and her three yearlings take two elk calves near Gibbon Meadows in May 1942 (Thompson 1942). In his field notes for 1942–1943, Olaus Murie recorded six elk calf mortality events, including park ranger Lee Coleman's observation of a grizzly consecutively killing and eating two elk calves near Dragons Mouth Spring, with the event lasting more than an hour (Murie 1943–1944). In *The Elk of North America*, Murie wrote, "No systematic study of bear food habits was made, but field examinations of bear droppings in the Yellowstone Park–Jackson Hole area over a period of years did not reveal an excessive percentage of

elk calf remains, and the elk herds in these areas continue to increase" (Murie 1951).

Believed to be attracted by elk calves, grizzly bears were seen gathering in the Swan Lake Flat area, where approximately 1,000 elk resided, as early as 1947 (Grimm 1947). Park ranger H.B. Reynolds witnessed an elk herd attempting to defend several calves from grizzly bears in Lamar Valley in the spring

of 1950. Three calves fell behind the herd of about 60 elk while being chased by three mature grizzly bears. The herd circled around and rejoined the elk calves several times, but the calves soon fell behind again. Each time the herd circled back to retrieve the calves, the grizzly bears drew closer. Finally, one of the calves darted past the herd instead of running into it with the other calves. It was soon captured and eaten (Reynolds 1950). A 1951 study, focused on the Gallatin elk herd ranging in part through northwestern YNP, tagged 132 elk calves to examine the biology of Rocky Mountain elk calves and investigate mortality sources (Johnson 1951). That study also documented bear predation of elk calves.

In anticipation of the congressionally-mandated wolf restoration in the mid 1990s, YNP implemented an elk calf mortality study throughout the park's northern range, led by Dr. Francis Singer from 1987 to 1990. That study documented survival rates as well as the timing and causes of elk calf mortalities in the absence of wolf predation. Singer et al. found that prior to wolf restoration, summer survival rates for northern Yellowstone elk calves were 50–85%, and 72% of all calf deaths during summer were due to predators (i.e., bears and coyotes, *Canis latrans*). Bear predation accounted for 23% of all calf mortality (Singer et al. 1997).



SHANNON BARBER

It has long been known that bears prey on Yellowstone elk calves. These grizzlies were seen in Lamar Valley in May 2005.

Design and Methodology

Capture

To investigate current causes of elk calf mortality, we are replicating, to the extent feasible, the methodology and experimental design for capture and monitoring of elk neonates used during 1987–1990 (Singer et al. 1997). That study was less extensive and comprehensive, but provides a baseline for comparison upon which to examine the impact of wolves on the YNP ecosystem and on elk calves in particular.

Each year, we captured a sample of 44–56 calves ≤ 6 days old, spatially and temporally distributed across Yellowstone's northern range. Spatially, we captured calves from four general areas (Mammoth/Stephens Creek, Swan Lake/Gardners Hole, Blacktail Deer Plateau/Tower, and Lamar Valley) to test for differential survival. Does a calf born in Lamar have a different survival probability than a calf born in Mammoth? Such differences, if found, may result from a variety of factors, including varying predator presence, quantity of preferred vegetation, or weather patterns.



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A young elk calf often remains still following capture and processing. At less than four days old, most elk calves tend to hide motionless versus run when they perceive danger.

To test survival differences based on temporal birth distribution, we captured calves born in the early (May 17–26), middle (May 27–June 5), and late (June 6–15) portions of the calving season. For example, a calf born early may “sneak by” before the predator's search image of an elk calf has fully developed or before predators concentrate on calving grounds. A calf born in the middle (peak) of the calving season may escape predation by the dilution effect: because elk are fairly synchronous breeders, many calves are born during the peak and any individual calf may have an increased probability of evading predators. A calf born in the late period may have a better chance of surviving if the majority of bears have already left the calving grounds for higher elevations, where they feed on army cutworm moths and whitebark pine nuts.

We conducted intensive helicopter and ground searches of the sampling areas from May 15 through June 15 to locate

elk neonates. Because most cow elk separate from the larger herd when they are ready to give birth, we searched for lone cows. Ground captures were attempted on calves observed opportunistically during May 15–June 15. Ground searches for calves were conducted from vehicles or by using spotting scopes to survey areas where calves were suspected based on maternal behavior or information from park visitors or staff. We conducted aerial searches during three 2- or 3-day periods in the early, middle, and late portions of the calving season (i.e., a total of 6–9 days during each calving season). When a calf was spotted, the pilot landed in the vicinity and two biologists manually captured the calf. We did not attempt to capture calves if predators were observed nearby.

During captures, we collected age, sex, and weight measurements, general body condition data, and blood samples. To minimize our impact on the cow–calf bond during capture, we wore fresh latex gloves for each capture, dressed in clothing that had been washed in “descenting” detergent, used a fresh side of a blanket washed in “descenting” detergent for each capture, minimized ground contact, and completed most captures in less than 10 minutes. We aged calves by examining their wobbly stance, incisor eruption, attached umbilicus, and status of hooves and dew claws (Johnson 1951).

We fit calves with 23-gm ear-tag transmitters designed to emit a radio signal for approximately one year, and to change pulse rate if motionless for more than four hours. This change



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A radio-tagged elk calf is released in the Swan Lake area following capture. Note the wide wobbly stance, indicating that the calf is less than two days old.

in pulse rate (i.e., “mortality mode/signal”) alerts us to a probable calf mortality and enables us to examine the carcass soon after death. In short, the transmitters allow us to quickly and conveniently monitor daily survival via aerial and ground telemetry without observing each animal.

Monitoring

From approximately mid-May through mid-July, when the risk of mortality to calves was relatively high, signals of radio-tagged calves were monitored via airplane for mortality each day at dawn. As calves became older and less prone to mortality, aerial monitoring was reduced to three times per week during mid-to-late July, twice per week during August–September, and bi-monthly throughout the first year of each calf’s life (approximately June 1). The pilot obtained locations for all dead calves using a Global Positioning System (GPS) unit. He also searched around carcasses for predators to reduce the risk that ground crews might walk in on a carcass with large predators nearby.

In addition to aerial monitoring, ground crews monitored transmitter frequencies three-to-four times per day until approximately July 15 and once per day from July 15 to approximately September 30. Telemetry was used to triangulate approximate daily locations of calves.



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Using telemetry, Yellowstone interpretive ranger John Meyer is attempting to locate an elk calf transmitter on mortality mode along the north side of Mt. Everts. The calf was determined to be killed by a black bear.



NPS/WENDY HAFFER

Elk calves that have not yet joined a nursery herd with other calves and cows will often hide under sage brush or near downed timber.

Mortality Site Investigations

Throughout the study, ground crews investigated mortality sites and conducted necropsies of dead calves to evaluate causes of death based on evidence such as predator tracks, consumption patterns, canine puncture measurements, and caching behavior. Bear kills were typically identified by the presence of a “banana-peeled” elk calf hide. Interestingly, we found that coyotes often buried elk calf heads. Wolves tended to consume the entire carcass, leaving little behind for examination. In such cases, predator tracks and DNA from predator scat and hair are used to identify the predator species.

For calf condition analyses, crews also collected the mid-sections of elk calf femurs, as well as metatarsuses. Marrow fat content from the femur midsection can potentially tell us if the calf was fat-depleted because nutritionally compromised animals will use fat stored in the marrow. However, marrow deposition in calves is not as well understood as it is in adults,



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Elk calf study volunteer Daniel Ravenel collects bear hair from branches near an elk calf mortality site for DNA analysis to determine bear species.



PHOTOS SHANNON BARBER



Top: Elk calves killed by bears typically result in a “banana peel” appearance. Bottom left: Cougars typically cache their prey with light forest floor debris. Bottom right: Coyotes bury elk calf remains with packed dirt.

Processing of Biological Samples

Marrow content and metatarsus-length analyses are conducted during winters in conjunction with the Yellowstone Wolf Project’s analyses of their wolf-killed elk marrow and metatarsus samples to ensure consistent methodology between studies and allow for comparisons. Additionally, blood samples collected during captures are being screened to test for diseases and other factors that might indicate predisposition to mortality (Kunkel and Mech 1994, Sams et al. 1996; Cook et al. 2001; Ditchkoff et al. 2001). Blood values such as blood urea nitrogen, thyroxine, cytokines, and serological values will be compared between surviving elk calves and those killed by predators. If blood values indicate that wolves, for instance, are primarily killing calves in poorer condition than those surviving, then wolf predation could be improving the overall condition of the elk herd even while reducing its numbers.

Bears accounted for approximately 55–60% of all deaths (including both predation and non-predation) for tagged elk calves during their first 30 days of life, while coyotes and wolves each accounted for approximately 10–15% of tagged calf deaths.

so interpretation of marrow fat content is questionable. Additionally, testing marrow fat content is only a one-way test. In other words, we can determine if the animal *was not* healthy, but we cannot confirm the animal *was* healthy, because the animal may have had an ailment not directly related to fat use, such as poor hearing. We collected the metatarsus because it is the last elk calf bone formed while in the womb. Therefore, a calf with a shorter metatarsus compared to those of other calves of the same age may have been born a runt, and therefore been more likely to die from predation.

Results

Capture

One hundred fifty-one elk calves ≤ 6 days old were captured and processed during the summers of 2003–2005. Table 1 indicates the number of calves captured, methods employed, and temporal and spatial distributions.

Estimated ages of elk calves at capture ranged from <0.5 days to 6 days, and were similar for females and males across years. Estimated birth dates of captured calves ranged between

Captures	Summer 2003	Summer 2004	Summer 2005	Total 2003–2005
Total captured	51	44	56	151
Ground captures	6	4	1	11
Aerial captures	45	40	55	140
Capture periods				
Early season	14	11	26	51
Mid season	17	20	18	55
Late season	20	13	12	45
Capture area				
Mammoth/Stephens Creek	14	12	13	39
Gardners Hole/Swan Lake	11	14	14	39
Blacktail Deer Plateau/Tower	10	10	11	31
Lamar Valley	16	8	18	42

Table 1. Comparisons of capture methods, timing, and locations for 2003, 2004, and 2005 radio-tagged elk calves on the northern range of Yellowstone National Park.

May 16 and June 10 during 2003–2005, with most calves born around June 1 each year. Calf capture and birth weights were similar across years, averaging approximately 17–18 kg and 14–15 kg respectively, with males tending to be heavier. Birth weights of calves were estimated from capture weights using

Wolves might be expected to be a significant limiting factor for recruitment in Yellowstone elk if much of their predation is additive to other mortality sources.

linear regression of estimated age versus capture weight. The estimated daily growth rate for each sex was applied to each calf's estimated age at capture to back-calculate estimated birth weights.

Mortality Causes

We will calculate final mortality and survival rates after all of our data are collected. What follows are not mortality rates, but rather the proportions of the calves' deaths that were caused by various factors.

In our study, predators have caused more than 90% of northern range elk calf mortality. In 2003 and 2004, more than 70% of this predation occurred within the first 15 days of life. Bears accounted for approximately 55–60% of all deaths (including both predation and non-predation) for tagged elk calves during their first 30 days of life, while coyotes and wolves each accounted for approximately 10–15% of tagged calf deaths. Causes of death for northern Yellowstone elk calves during summers 2003–2005 were generally similar.

Some of the rarer elk calf mortalities we recorded included one probable drowning, one calf likely killed by a golden eagle (*Aquila chrysaetos*), one low-birthweight calf, one calf likely dying from complications associated with pneumonia, one hunter-killed calf, and one calf probably dying from exposure to cold. Interestingly, the calf presumed to have died from exposure to cold was found intact, with fresh bear and wolf tracks in the snow less than 10 m from the carcass. To date, we have only recorded one elk calf killed by a cougar (*Puma concolor*). There was also one yearling (tagged as a calf in 2003) that likely died from infection after being scalded in a hot spring near West Thumb.

Conclusions

The bear predation results of the 1987–1990 elk calf study were not surprising, considering the absence of wolves and that bear predation of neonatal ungulates has been noted in various studies covering different geographic areas and diverse ungulates (Kunkel and Mech 1994; Zager et al. 2002; Festa-Bianchet et al. 1994; Ballard et al. 1991). However, the ratio of predators to prey on the northern range has increased since that study. Wolves were restored to YNP

during 1995 and 1996, and rapidly increased in abundance and distribution. Approximately 171 wolves resided in YNP during 2004 (USFWS et al. 2005). At the end of 2004, the highest density of Yellowstone wolves within the park occurred on the northern range, where 84 wolves resided

in seven packs (USFWS et al. 2005). Elk calves accounted for 15% of documented Yellowstone wolf kills during 2004 (USFWS et al. 2005). Thus, wolves might be expected to be a significant limiting factor for recruitment in Yellowstone elk if much of their predation is additive to other mortality sources.

We had anticipated that bear predation would likely be a relatively higher source of early calf mortality, but that wolf predation would increase during autumn and winter,



PHOTOS SHANNON BARBER

Left: Heavy rains the night before likely caused this elk calf to drown in an otherwise shallow creek in northern Lamar Valley. Right: This elk calf was likely killed by a golden eagle near Blacktail Deer Creek. The previous study (1987–1990) also recorded one eagle-killed calf.



VINCE GREEN

This elk calf likely died of exposure following late spring snow and freezing rain. Fresh bear and wolf tracks were found in the snow less than 10 m from the intact carcass.

due in part to their different hunting styles. Grizzly and black bears appear to concentrate in elk calving areas on the northern range during May and June, searching in grid-like patterns for hiding neonate calves (Gunther and Renkin 1990), whereas wolves tend to select vulnerable prey while testing groups of elk (Smith et al. 2003). Thus, wolves may be more likely to kill calves within groups of elk during autumn and winter.¹ Studies of caribou calf mortality in Denali National Park, Alaska, found that bear predation was

One explanation may lie in bear numbers, and in the success of grizzly bear recovery in the Greater Yellowstone Area (GYA).

predominant early in the calving season, but declined with calf age, while wolf predation peaked later in the season (Adams et al. 1995). Also, bears obviously are not a factor in calf mortality while in their winter torpor.

It is surprising, however, that wolves are apparently having less impact on elk neonate survival than bears. One explanation may lie in the numbers, and in the success of grizzly bear recovery in the Greater Yellowstone Area (GYA). Surveys suggest that the abundance of GYA grizzly bears has increased since the 1987–1990 study. The minimum population estimate for GYA grizzly bears increased from 150 in 1987 (Haroldson et al. 1998) to 431 in 2004 (Haroldson and Frey 2005) which translates to approximately 70–92 grizzly bears on the northern range during summer

(K. Gunther, YNP, personal communication). Black bears occur in unknown numbers, but are also seasonally abundant on the northern range during autumn and summer (K. Gunther, YNP, personal communication).

The results of this study have immediate relevance to the Montana Department of Fish, Wildlife and Parks in setting harvest quotas for local elk hunts, and to the U.S. Fish and Wildlife Service regarding the delisting of wolves. For example, the Montana Department of Fish, Wildlife and Parks has already proposed a reduction of antlerless elk permits from 1,100 to 100 for the Gardiner Late Hunt based on evidence of continued low recruitment of elk calves into the adult elk population. Furthermore, information regarding the effects of wolves on ungulate population dynamics and, in turn, other interactions (such as elk–vegetation) has implications for areas throughout the U.S. and abroad, where wolves and other large predators (e.g., black bears) are recolonizing and increasing in density. Ultimately, this study will contribute to basic scientific knowledge about wolf–prey interactions and factors that predispose neonates to mortality.

We will continue to monitor radio-tagged calves through spring 2006. These data will enable us to compare trends in survival rates and cause-specific mortality among years, and evaluate factors that may predispose calves to death.

YS

Footnote

¹ Due to high summer mortality in our study, our results to date are necessarily biased toward early calf mortality and may not correctly depict mortality sources during winter. Also, the majority of calves in our study that survived the summer wintered in the Mammoth/Stephens Creek study area, so our winter sample is not as well distributed as our summer sample.

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Tom Lemke of Montana Fish, Wildlife and Parks (MTFWP) assisted with the necropsy field crew and aerial captures. Neil Anderson (MTFWP, Bozeman, Montana) performed necropsies of intact elk calf carcasses and tissue samples were analyzed by the State of Montana Department of Livestock Diagnostic Laboratory Division (Bozeman, Montana). Lisette Waits and Cort Anderson of the University of Idaho (Moscow, Idaho) performed DNA analyses of predator hair and scat samples. Kristy Pilgrim of Carnivore Conservation Genetics Laboratory (Missoula, Montana) also performed DNA analyses on one hair and scat sample. Dr. James Half-



Dan Krapf, along with Wendy Hafer and Mike Wagner of the Yellowstone Fire Cache, assisted in three years of helicopter captures of elk calves.

penny trained our 2005 crew on predator hair identification. Rick McIntyre and the Yellowstone Wolf Project shared their information on elk calf natality and mortality. Also, the Yellowstone Wolf Project graciously provided us the use of a vehicle each summer. Yellowstone's Bear Management Office shared information regarding bear feeding behavior, and Dr. Francis Singer provided helpful consultation during both the design and analysis stages of the project.

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Dr. P.J. White and Shannon Barber capture and process an elk calf after spotting it from the helicopter.

Shannon Barber is a Ph.D. candidate in the Wildlife Conservation Program at the University of Minnesota. She recently completed research on photopollution impacts on the nocturnal behavior of the marsupial sugar glider. **Dr. L. David Mech** is a senior scientist for the Northern Prairie Wildlife Research Center, U.S. Geological Survey and an adjunct professor at the University of Minnesota. He has studied wolves and their prey since 1958. **Dr. P.J. White** is a wildlife biologist for Yellowstone National Park. His work primarily focuses on ungulates and winter-use issues.

FROM THE ARCHIVES



This souvenir photo of the Lower Falls was taken by A.G. Lucier, a commercial photographer in Powell, Wyoming, in the 1920s–1930s. Lucier, who settled in Powell in 1908, was a traveling photographer who came West to try his hand at beekeeping. Though his apiary was successful, he was soon back in the photography business as well. Upon its completion in 1910, Lucier's photos of the Shoshone (now Buffalo Bill) Dam near Cody, Wyoming, were published in *National Geographic*. Lucier also photographed and sold prints of Yellowstone National Park and its wildlife.

—Information courtesy American Heritage Center, University of Wyoming

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Grand Canyon Hotel
Supervolcano and the Media
Elk Calf Mortality



ALICE WONDRAK BIEL

Sign seen in Buffalo, Wyoming, June 3, 2005.

Coming this fall, look for
an article on conservation strategy in the GYE.

YELLOWSTONE SCIENCE

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