YELLOWSTONE SCIENCE

volume 12 • number 4 • fall 2004

Heritage and Research Center

Myth and History in the Creation of Yellowstone National Park

Yellowstone's Botanist and Herbarium

Musings from the Berry Patch

The Bridge Bay Spires

This 1902 first edition of John Muir's *Our National Parks* includes an essay on his 1885 visit to Yellowstone. The book is inscribed to Hiram Chittenden, who donated it to the park. It now resides in the research library in the Yellowstone Heritage and Research Center.

Sharing Our Heritage

THE DUST HAS SETTLED. Those of you who live in or pass through Gardiner may have noticed the Yellowstone Heritage and Research Center (HRC) rising up and taking form this past year. Finally, Yellowstone will have a state-of-the-art facility, commensurate with the quality of the collections it houses. Prior to this, the park's historians, archivists, librarians, and curators struggled heroically to preserve our invaluable items in the cramped quarters of the basement of the Albright Visitor Center. Interpreters working upstairs tell stories about these faithful stewards of our history quickly mobilizing to carry out our most treasured and sensitive objects in cardboard boxes whenever there was a plumbing accident in the restrooms above.

The title of the recent management consultant book, *Who Moved My Cheese?,* echoes in my mind the question, "Who moved our heritage?" The answer: teams of curators from all over the National Park System, who flew in to assist with this Herculean task that required such precision and care, all under the direction of park curator Colleen Curry, who not only masterminded this monumental effort, but planned a wedding (her own) at the same time.

When the HRC opens, we will be able to offer much easier access to our library, archives, and museum collections. We will finally be able to more readily share our heritage with park employees, visiting researchers, and interested members of the public; the HRC has a large reading room and a public research room for this purpose. The accomplished interpreter, Freeman Tilden, wrote about the power of "the thing itself." Yellowstone's collection has 5.3 million such things. Together, they tell the origin stories of Yellowstone, the National Park Service, and the world-wide conservation movement. I get inspired each time I see things like a first edition of John Muir's *Our National Parks,* signed by the author, or Native American artifacts, or an original Moran painting, or some of the first ranger uniforms, or the Shaw and Powell stagecoach, and on and on. For more information on the history of the collections and the HRC, read Tami Blackford's article in this issue.

The HRC also preserves many natural history items. In this building, you'll find geology, paleontology, and archeology labs. A *Yellowstone Science* interview with park botanist Jennifer Whipple goes into detail about the park's herbarium, now in the HRC. Dr. Russell Cuhel's article about the spire removed from the bottom of Yellowstone Lake, which now resides in the park's museum collection, highlights a research effort that was inspiring both scientifically and aesthetically.

This fall, after cleaning up my family's home in Florida after a barrage of hurricanes, I took a well-needed vacation to Europe for several weeks. I saw the remarkable natural and cultural history collections in Vienna, Austria, preserved by the foresight and largesse of Empress Maria Theresa. I marveled at the awesome beauty of the Swiss Alps. In Florence, I viewed Michelangelo's masterpiece sculpture of David. I hiked the trails of Italy's Cinqueterre National Park. I stayed in a restored farmhouse villa dating back to the year 998. I was immersed not only in the Tuscan sun, but in its history, vineyards, food, wine, and the good will of its people who were proud to share their culture. Walking through the narrow stone streets of the medieval hill town of Assisi to the Basilica of St. Francis, I came upon a strangely familiar sight—the same plaque denoting a World Heritage Site as we have here in Yellowstone. I was reminded of the international significance of Yellowstone's resources, and was happier still that we will soon be better able to share our heritage with people from all parts of the world.

Rogn Anderson

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ROGER J. ANDERSON
Editor

TAMI BLACKFORD
Associate Editor and Graphic Designer

MARY ANN FRANKE
VIRGINIA WARNER
ALICE WONDRAK BIEL
Assistant Editors

ARTCRAFT PRINTERS, INC.
Bozeman, Montana
Printer

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Submissions are welcome from all investigators conducting formal research in the Yellowstone area. To submit proposals for articles, to subscribe, or to send a letter to the editor, please write to the following address:
Editor, *Yellowstone Science*, P.O. Box 168, Yellowstone National Park, WY 82190.
You may also email: Roger_J_Anderson@nps.gov.

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The Yellowstone Heritage and Research Center, 2004.
NPS photo by Virginia Warner.

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A snowplane cockpit and a circa 1915 plate from the Canyon Hotel. Both items are part of the museum collection, which now resides in the Heritage and Research Center.

FEATURES

DEPARTMENTS

News & Notes

NPS/TAMI BLACKFORD

Translocated Canada Lynx Travels Through YNP

This past summer, a biologist with the Colorado Division of Wildlife notified Yellowstone staff that a male lynx they had translocated from British Columbia to Colorado was passing through the Greater Yellowstone Area. The lynx was released in March 2003 and equipped with a Dopplar collar tracked by satellite. In early June, he left his established home range in the Snowy Mountains of Wyoming. At the end of July, he was west of Jackson, Wyoming. In early August, he was located near the Grassy Lake Reservoir between Yellowstone and Grand Teton National Parks, and then near Mammoth Hot Springs in Yellowstone. By late August he was north of Livingston, Montana, near the Crazy Mountains. In October, the lynx turned west and was located north of Missoula, Montana.

This is considered an unusual move for a lynx translocated to Colorado, but long distance moves by lynx in general are not uncommon. Biologists suspect the cat may return to his home range, or even to Colorado. There wasn't enough data to know if the lynx interacted with any individuals resident to the Yellowstone ecosystem, but it does not appear that he traveled around the east side of Yellowstone Lake, where there are resident lynx in the park.

Nez Perce Memorial Ceremony

On August 21, 2004, for the first time in Yellowstone National Park's history, members of the Nez Perce (or Nimíipuu, meaning "we the people" or the "real people") gathered in the park along Fountain Flat Drive near Nez Perce Creek for a memorial and pipe ceremony to commemorate their ancestors who endured hardship and died in the park during the 1877 Nez Perce War. The memorial was also open to and attended by park visitors and staff, including Superintendent Suzanne Lewis and Deputy Superintendent Frank Walker, who for almost eight years was superintendent of Nez Perce National Historical Park in Spalding, Idaho.

Nez Perce Elder Horace Axtell and Tribal Council Member Wilfred Scott led the ceremony. It began with a brief introduction, which was followed by drumming, singing, and a flute song played by Levi Holt. All the men present at the ceremony were invited to join the pipe circle, and then all women veterans and law enforcement officials as well.

Eight Nez Perce Appaloosa Horse Club members in full regalia rode down the hill and around the pipe circle three times counter-clockwise. Kay Kidder, president of the Nez Perce Appaloosa Horse Club, Director of Adult Education for the Nez Perce Tribe, and daughter of Horace Axtell, introduced the riders, then talked about her relatives who were in the war and came through Yellowstone, and how that history has affected her life. The Nez Perce rode down along the Firehole River in single file and back up the hill.

When the pipe ceremony began, everyone was asked to put recording devices away. Two pipes were passed around the circle, again counter-clockwise, three times. Introductions were made around the circle, and some people told a short story about themselves, how they were related to the Nez Perce who came through the park, and the wars they have fought in. Many gifts were presented by the Nez Perce. Everyone participated in the conclusion of the gathering, the retiring of the eagle-feather staffs, which, to the Nez Perce, is like the lowering of the American flag.

Bird Deaths at Heart Lake

During the last week of August, park ornithologist Terry McEneaney was notified of several songbird deaths reported by visitors at Heart Lake. Richard Jones, backcountry ranger at Heart Lake, collected several songbirds and relayed information concerning the findings to McEneaney. On September 1, McEneaney traveled to Heart Lake to identify the species and examine the scene where the deaths occurred. Although West Nile Virus has not reached YNP yet, it could occur at any time, and this incident was investigated thoroughly, to either rule it out or properly document it. With help from two wildlife pathologists, necropsies were performed on several of the specimens. All concluded that because the birds were insectivores, they most likely died from starvation as a result of a storm in the Heart Lake area on August 25–26. The birds' intestines were empty of food, which is a classic symptom of starvation. The nine birds collected were as follows: one yellow-rumped warbler, one olive-sided flycatcher, two tree swallows, and five Western wood-pewees.

Congratulations to NPS Archeologist Jacquelin St. Clair

Jacquelin St. Clair, NPS archeologist at Grand Teton National Park, has been elected by the general membership to the Board of Directors, Members at

Large, of the Plains Anthropological Society. Congratulations to Jackie, for the peer recognition of your professional abilities, ethics, and dedication.

The Plains Anthropological Society's membership includes individuals from all branches of anthropology and related disciplines. The two primary functions of the society are to hold an annual conference, the Plains Conference, and publish a peer-reviewed quarterly journal, the *Plains Anthropologist.* Both activities are dedicated to communicating and disseminating information about past and present human cultures on the North American Great Plains.

Archeology has been the focus of many of the society's activities and publications, but major contributions are also made by ethnohistorians, ethnologists, linguists, physical anthropologists, and geoscientists. Students and private citizens as well as professionals enjoy membership in the Plains Anthropological Society.

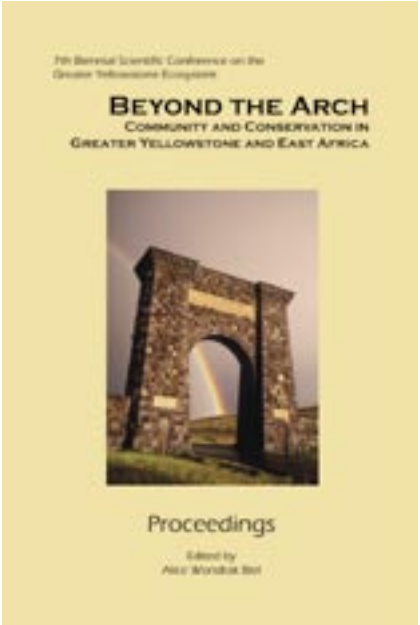
Jacquelin St. Clair received a BS and MA in Anthropology from the University of Wyoming, with emphasis in High Plains archeology and bioarcheology. She has conducted fieldwork in the Rocky Mountains, Plains, and Great Basin. Her goals for Grand Teton National Park are to continue archeological research of the High Plains and Late Paleoindian Foothill/Mountain sites, seeking a better understanding of how sites within this area of northwestern Wyoming should be understood within the broad picture of human adaptation in the region. Additional duties at Grand Teton National Park include overseeing site recordation and protection, educational and ethnographic projects, and working as liaison for tribal issues.

An enrolled member of the Seminole Nation, Jackie was a 1999 recipient of the Plains Anthropological Society's Native American Student Award. Her stated goals for her term on the Board of Directors of the Plains Anthropological Society are the development of special programs and sessions pertaining to the cultivation of positive relationships between native peoples and anthropologists.

Fourth and Seventh Conference Proceedings Almost Available

In 1997, the Fourth Biennial Scientific Conference on the Greater Yellowstone Ecosystem, *People and Place: The Human Experience in Greater Yellowstone,* focused on the past, present, and future of the area's cultural resources.

Anyone who presented at or attended the conference is on the list to receive a copy of the proceedings, but we need your help. We assume that our mailing list is out of date. If you attended the conference and would like us to send you a copy of the proceedings, please call or email Virginia Warner at (307) 344-2230, or virginia_warner@nps.gov with your current address. If you were not an attendee but would like to receive a copy, you may also contact Virginia, as there will be extra copies available. They will be printed after the first of the year.



The proceedings from the Seventh Biennial Conference on the Greater Yellowstone Ecosystem, *Beyond the Arch: Community and Conservation in Greater Yellowstone and East Africa,* will also be available after the first of the year. This conference took place in October 2003, and hosted a world-class slate of keynote speakers, including Dr. Richard Leakey. The primary theme that emerged from the conference was the question of whether conservation efforts are most effectively directed from the national or local scale. If you would like to receive a copy, please call or email Virginia Warner as above.

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Passages — Glen F. Cole

by Mary Meagher

Glen F. Cole was born in 1926 and died in August 2004. He was supervisory research biologist in Yellowstone National Park from 1967 to 1976. He was a scientist, a dedicated field biologist, and a fine fly fisherman.

Yellowstone was fortunate to have Glen Cole. He came to Yellowstone from Grand Teton in the latter part of the furor generated by the elk reductions of the 1960s in Yellowstone National Park. He commented once that he thought the park had been on the verge of Congressionally-authorized elk hunting (the only way hunting could happen in Yellowstone), and his assignment was as a scientist, to assess the data on which the reductions had been based, foster the acquisition of new data, and to advise management accordingly.

Because of the reduction turmoil, and because of two independent assessments of the state of science in the national parks (the Robbins Report made by the National Academy of Sciences, and the Leopold Report, both in 1963), the Park Service again became serious about science, particularly to address problems of national parks as natural areas. Glen became the supervisor of the research staff assigned to four national parks that had contentious large mammal issues: Glacier, Yellowstone, Grand Teton, and Rocky Mountain. He and all the personnel he supervised were Washington Office employees who were field assigned, to distance the science efforts from direct supervision by park management.

Glen was unusual in his ability to embrace different agency objectives. His professional career had begun as a biologist for Montana Fish and Game (now Montana Fish, Wildlife and Parks). In working for that agency, he was immersed in questions related to maximum sustainable harvests of game animals, and in related topics of range management—the primary objectives of all game and fish departments of the time. But Glen readily (and eagerly) shifted his thought processes to the radically different management objectives that pertain to natural area management. He began to question such dogma as how an animal (elk in this case) could evolve to destroy the food source essential to its own survival over time—the overgrazing issue that plagued the Yellowstone elk topic for decades. He asked how plant and animal systems functioned successfully for the millennia before biologists, hunters, range managers, and agency bureaucrats arrived on the scene. He looked at range management techniques he'd used in his former professional life and questioned their validity, commenting that only if a technique or measurement entailed population consequences for the species at question might insight be gained into the real plant–herbivore relationships. Underlying all of these was the question of what had or had not present-day people done to alter the system.

A favorite saying was "small but excellent" in referring to the half dozen research biologists he supervised and the product he expected from them. He was committed to data if at all possible, and rightly so, to support management actions, but he recognized that management cannot always wait for all the answers. Sometimes a carefully reasoned rationale might be necessary, drawing from the then-available ecological literature, and that a program might change with new data—now called that "in" term *adaptive management.* (The grizzly bear controversy that focussed on how and when to close the park's open-pit garbage dumps is a classic example.) In many respects ecologically, Glen was ahead of his time. His legacy to Yellowstone focused on elk and the other large ungulates, grizzly and black bears, restoring a natural fire regime, fostering native fish over the introduced non-natives. But he laid much ground work for other issues such as the eventual return of the wolf.

The research office was an exciting place to be with the constant back and forth discussions that Glen generated so well. Indeed, he was at his best in that setting, or that of his Montana generation, one-on-one over a bourbon or other suitable libation. A gifted public speaker he was not, nor did the ego trappings of status and visibility hold much for him. His yardstick was whether or not a person could do the job they'd hired out to do, and whether or not, individually and collectively, his people could make the park a better place as a natural area.

Gladys Cole, his wife, was a crucial part of all this, as "sounding board," social secretary, critic when useful, and otherwise the private supporter that did so much to foster what he accomplished. As Gladys noted in her communiqué to those of us who knew Glen well "We often called him the 'Kabetogama Curmudgeon' but we fondly remember him as a loving husband and father, first class fly fisherman, and a dedicated biologist."

For more information, see Glen Cole's interview in *Yellowstone Science* 8(2):13–18. For historical documentation of Glen Cole's time, see:

Pritchard, James A. 1999. *Preserving Yellowstone's Natural Conditions: Science and the Perception of Nature.* University of Nebraska Press. Lincoln, Nebraska.

Sellars, Richard W. 1997. *Preserving Nature in the National Parks: A History.* Yale University Press. New Haven, Connecticut.

YS

NPS/VIRGINIA WARNER

The Yellowstone Heritage and Research Center

A Worthy Home for Wonderland's Collections

Tami Blackford

NPS/VIRGINIA WARNER

In 1928, the display of an old stagecoach in front of the Mammoth museum prompted a Congressional inquiry into the park's preservation of it. The Congressman was told that the stagecoach was only outside during the summer season and that if a large museum should be built at Mammoth, the stagecoach would be exhibited indoors and given preservation treatment. He was also told that the park did, indeed, understand the value of the stagecoach.

ALTHOUGH NOT YET GUARANTEED A PERMANENT HOME, a stagecoach will soon be on public exhibit, indoors, in a large museum storage facility on Yellowstone National Park land in Gardiner, Montana: the Yellowstone Heritage and Research Center (HRC). After years of planning, financial struggles, and a summer of backbreaking labor, Yellowstone's museum, library, and archival collections have finally moved into their new home in the HRC. Making this historic move were items such as original Thomas Moran watercolor sketches, more than 500 images by noted Western photographer William Henry Jackson, artifacts from prehistoric sites such as Obsidian Cliff National Historic Landmark, weapons and uniforms from the U.S. Army and National Park Service, and Nathaniel P. Langford's

Thomas Moran's 1871 watercolor sketch of Firehole Springs.

original handwritten lecture presented in various places during the winter of 1870–71 to popularize the Yellowstone area. When Ferdinand V. Hayden heard this lecture in Washington, D.C., in January 1871, he was inspired to ask Congress for funds to support an exploratory expedition to the region, which became a reality that summer. The rest is history. The HRC now houses these items and millions more in a facility worthy of the national and international significance of Yellowstone's collections, their need for protection, and the public's desire for accessibility to them.

It seems fitting that this building was completed in 2004, while the National Park Service (NPS) celebrated its museum centennial. In 1904, Yosemite National Park established an arboretum that is arguably the first museum in a national park. Collectively, the NPS manages the world's largest museum system, with more than 350 parks preserving more than 105 million objects, specimens, documents, and images. What makes these collections extraordinary is that they are often preserved in the actual places where people and events have shaped history and the environment. It is NPS policy to collect, protect, preserve, provide access to, and use objects, specimens, and archival and manuscript collections to aid understanding and advance knowledge. Collections play important roles in resource management, research, and interpretive programs, and function as baseline databases for park natural and cultural resources.

Yellowstone has the second largest collection in the NPS, with more than 5.3 million items (the largest belongs to Edison National Historic Site, which contains more than 6 million items). For comparison to other large, primarily natural resource parks, the collections in Yosemite consist of more than 2.1 million items, in the Great Smoky Mountains there are more than 440,000, and in the Grand Canyon, more than 360,000. Yellowstone's collections document not only the cultural and natural history of the world's first national park and the condition of its resources, but also national parks and conservation movements throughout the world. The collections grow continuously with the addition of archival records, archeological and natural science objects, and important donations and purchases, such as the more than 20,000-item Susan and Jack Davis Collection (highlighted in *Yellowstone Science* 9:4). About 5,000 Davis Collection items are still in storage in Bozeman, Montana, awaiting the purchase, funded by the Yellowstone Park Foundation, of storage cabinets for the HRC.

The park's museum, library, and archives were previously located in 2,848 square feet of the basement of the Horace Albright Visitor Center at Mammoth Hot Springs. There, they were visited by more than 1,500 people annually, most of them researchers, including undergraduate and graduate students and historians. Other visitors are filmmakers, documentary producers, journalists, other media professionals, park staff, and the general public. The number of people wanting access to the collections is expected to increase dramatically when the HRC opens to the public in spring 2005.

For years, the collections were housed in various locations within and outside the park, where they were frequently threatened by flood, fire, environmental degradation, theft, and inattention. With the opening of the HRC, the collections of "Wonderland" are finally housed together (with the temporary exception of the historic vehicles, *see sidebar, "HRC Phases II and III, and the Historic Vehicle Collection"),* and their storage brought up to the standards demanded by

the NPS, the American Association of Museums, and the National Archives and Records Administration. This 32,000-square-foot, state-of-the-art facility is located on seven acres adjacent to the Gardiner School. It now houses almost 3,000 linear feet of historic records, 90,000 photographic prints and negatives, 20,000 books and manuscripts, and 300,000 natural science specimens and cultural objects. The HRC provides a 500% increase (from 1,642 to 8,017 square feet) in library and archives space including storage, processing areas, reading rooms, and offices, and a 700% increase (from 1,206 to 8,906 square feet) in museum spaces including storage, processing areas, and offices. It was not only designed to improve space for the collections, including room for 25 years of growth, but also to improve access and ease working conditions for employees, visitors, and researchers; increase security; better accommodate tours; and showcase rotating exhibits. How this facility came to be is a story in itself.

The Park and its Collections are Established

When Congress established Yellowstone National Park on March 1, 1872, no funds were appropriated for its management. For its first 14 years, civilian "volunteer" superintendents appointed by the Secretary of the Interior administered the park, but they kept very few records. The earliest original pieces in the archives, which are letters from Superintendent Philetus W. Norris, date to 1877. There are also photocopies and microfilm of letters (the earliest are from Superintendent Nathaniel P. Langford to the Secretary of the Interior) and records dating to 1872. The originals reside at the National Archives in Washington, D.C.

When the U.S. Army arrived in 1886 to administer the park, they instituted military record-keeping practices, documenting park activities, management decisions, and the philosophical development of the national park idea until their departure in 1918. With its creation in 1916, the National Park Service took over the park's administration, inheriting the policies and philosophies established by the military. At that time, Horace Albright, who had been influential in establishing the NPS and was a future Yellowstone superintendent and NPS director, insisted that the army's park administration records remain in Yellowstone. (Their military records are held at the National Archives in Washington, D.C.) The army's records as well as the early NPS records therefore remained in the park, but were stored haphazardly in various closets and buildings. It wasn't until 1935 that the National Archives Act

This Willys pumper truck (left) and tank truck (right) are part of the historic vehicle collection. See the park's website at http.www.nps.gov/yell/technical/museum/historicvehicles/index.htm for more information on this fascinating part of the museum collection.

HRC Phases II and III, and the Historic Vehicle Collection

Two HRC wings are still in the plans, although no funding is currently available for either. An east wing (Phase II), for which funding proposals are out in the amount of $3,852,800, would add a 14,000-square-foot, single-story building for the storage, preservation, and display of the museum's historic vehicle collection, including room for 25 years of growth. Many of these vehicles were received from former park concessioners, but new vehicles are added to the collection as they become obsolete or surplus to needs. For example, this fall, a two-stroke snowmobile was added.

Yellowstone's vehicle collection is the largest and most significant in the NPS. It contains 30 horse-drawn and motorized vehicles, ranging from stagecoaches to touring cars to a fire engine. The vehicles occupy 8,000 square feet in a historic 1925 warehouse assigned to a park concessioner on park land in Gardiner, Montana. The building also houses the park's recycling center, and was not designed for museum storage. Volunteers have cleaned the vehicles, and the Yellowstone Association and Yellowstone Park Foundation have provided funding for vehicle preservation and conservation. Federal funding has also recently allowed for extensive preventive conservation treatment by NPS staff. Despite improvements to the warehouse's environment and efforts to reduce pest infestations, the building remains deficient according to NPS museum standards. It is also poorly located for security and safety concerns, and inaccessible to the public.

A science research wing to the west (Phase III), for which funding is not yet being sought, will house natural history research and laboratory facilities for staff and outside researchers. There are currently more than 200 research projects taking place in the park by scientists from all over the world. Research project subjects range from education and management to archeology to microbiology to bison, elk, and wolves. Findings from such research benefit park management.

provided a systematic and centralized process for the preservation of records documenting government administration. *(See sidebar, "What's Worth Saving?".)*

Lee Whittlesey's upcoming book, *Storytelling in Yellowstone: Horse-and-Buggy Tour Guides in the Grand Old Park, 1872–1920,* reports on the early establishment of the library and museum collections in the park. Attempts to establish a park library took place as early as 1902, when Major Hiram Chittenden supervised the collection of park literature including books, magazine articles, and newspaper clippings. He also donated many of his personal books to the park. Captain George S. Anderson, acting superintendent from 1891–1897, amassed a large personal collection of park-related books and articles and donated it to the park as well. In 1908, Acting Superintendent General S.B.M. Young bought books to better educate and inform staff, and from these three sources, a research library was formed. In 1933, a group of private citizens founded the Yellowstone Library and Museum Association (now the Yellowstone Association, the park's cooperating association), with the initial goal of establishing and developing a research library for Yellowstone National Park. To this day, the Yellowstone Association provides funding to the park for librarian positions and many other aspects of the museum and library programs.

Depending on your definition of a museum, one of the first efforts to establish a museum in Yellowstone took place in 1874, when Harry Horr, Jack Baronett, and Captain Frank Grounds made plans for a zoo to exhibit park animals, but it is unknown whether the idea became reality. In 1885, George L. Henderson set up his short-lived Cottage Hotel "museum," which was also a gift shop or store, and contained coated specimens, stuffed animal heads, and mounted birds. Around 1910, Milton Skinner heard about a proposal to build a government museum at Mammoth and began to advocate it. In 1913, Acting Superintendent Colonel Lloyd M. Brett was the first government official to suggest that the new administration

Items such as this table and chair are collected because they represent early furniture used in the park's hotels.

What's Worth Saving?

Although the HRC was designed to accommodate 25 years of growth in the collections, the museum storage area (when the huge backlog of objects that need to be cataloged and housed is included) is practically filled to capacity—the result of just how difficult it was to project that need. During the planning for the HRC, it was considered that in the future, the park would install rail-mounted, high-density shelving as a means for accommodating collection growth. Therefore, the floors in the collection storage areas were designed for the heavier loads imposed by such storage systems. It takes a lot of room to properly store and preserve objects, and the collections will, inevitably, need more space. As with all museums that actively collect, someone has to decide what is worth saving.

To facilitate that process, the museum and the library both have a Scope of Collections statement that describes what the park should and needs to collect. Museum curator Colleen Curry plans to establish a collections acquisition committee to discuss each new item. Once an object is accepted into the collection, it becomes an expensive endeavor to preserve, protect, and interpret it for future generations, so a lot of thought needs to be given to each object. It is fortunate, because the park can't accept everything, that several other museums in the area collect similar objects and themes.

Staff also plan to start a deaccessioning program, which is the formal way of removing objects from the collections. As with many museums, whenever someone offered an object in the park's early days, it was usually accepted, regardless of whether it really belonged. Deaccessioning is an involved process that requires many people's input to maintain a system of "checks and balances," ensuring that important items are not removed just because a single individual does not like or does not understand an object. A deaccessioned item is first offered to another NPS or non-profit museum.

For archival materials, the Federal Records Act of 1950 sets the guidelines for managing all newly generated records. The General Services Administration puts out a handbook for all federal agencies that lists schedules for all documents, including the length of time they must be retained and how they must be disposed of. In Yellowstone, the archives tries to actively collect both scheduled and unscheduled, historically significant records that provide evidence of park policies, procedures, and functions as well as important information on people and events. Some examples include wildlife censuses, staff meeting minutes, road and building project reports, wildland fire reports, and correspondence between park staff and members of Congress.

building being constructed in Mammoth also incorporate a museum to house "all that is interesting in historical data and specimens of natural curiosities, etc.," but for many years, the idea of a museum in Mammoth was put on hold in anticipation of and disagreements over a general development plan for the Mammoth area. Brett also suggested a museum system that would entail erecting branch museums in other park locations and hiring interpreters to staff them.

The first official mention of a museum in Yellowstone was in 1919. In his report to the Secretary of the Interior that year, NPS Director Stephen Mather noted that a room in one of the former Fort Yellowstone buildings had been developed into a museum, and that specimens were being prepared for exhibit. In 1920, Mather called for the "early establishment of adequate museums in every one of our parks," to include space for a good collection of library books relating to the park. The NPS partnered with the American Association of Museums, with funding from the Laura Spelman Rockefeller Memorial, to develop model museums in Yellowstone, Yosemite, and Grand Canyon National Parks. By 1922, today's Albright Visitor Center building, formerly the army's bachelor officers' quarters of Fort Yellowstone, hosted botany and paleontology exhibits, and geological specimens and animal heads were mounted on the walls. From then until today, the visitor center has housed a museum collection, although space and visitor access were concerns as early as 1924.

For a brief period in the 1920s, the park's first branch museum, the "Buffalo Jones museum," interpreted the history of bison conservation in the park. It was operated at the site of today's Mammoth corrals, in conjunction with an equally short-lived wildlife zoo and the popular bison show corral. Between 1928 and 1930, the park opened branch museums at Old Faithful, Madison Junction, and Norris Geyser Basin in partnership with the American Association of Museums. The Fishing Bridge Museum opened in 1931.

Mary Meagher, retired research biologist, was museum curator from 1959 to 1968. By her own account, she was "cursed with a housekeeping mind," and as curator, she overhauled the museum collections, recataloging everything, recording missing items, deaccessioning items, and refiling the library the way a biologist would. According to Meagher, in the early 1960s, Jack Ellis Haynes, son of early park photographer and concessioner Frank J. Haynes, proposed a building in the park to house the collections. Jack grew up in the park, and became a writer, photographer, and concessioner in his own right. He wanted some of his huge collection (which was not all park material) to come to Yellowstone, but stipulated that the park provide a facility with proper environmental controls and security. Yellowstone could not meet his conditions, and instead, his collections went to various institutions, including the Montana Historical Society in Helena, Montana, and Montana State University Special Collections in Bozeman, Montana. It was about this time, and in large part through the work of Aubrey Haines, that Yellowstone's records began to receive the attention they deserved.

Aubrey Leon Haines, August 30, 1914–September 10, 2000.

Aubrey Haines Picks Up the Pieces

No mention of Yellowstone's collections can be made without acknowledging the extraordinary contributions of Aubrey L. Haines, who wrote what is considered the most important history of the park, *The Yellowstone Story*, which is still widely used today. Haines also wrote many other invaluable books, articles, reports, and writings on the park. Haines graduated from the University of Washington with a degree in forestry engineering, and in 1938 accepted a ranger position in Yellowstone. He always had a natural interest in history. After serving four years as a topographic surveyor in the U.S. Army Corps of Engineers during World War II, he returned to Yellowstone in 1945 and quickly became the park's assistant engineer, but soon left again to professionalize his engineering background by earning an MS in forestry from the University of Montana in Missoula. While there, he also took many history courses. He then returned to the University of Washington and worked toward a doctorate, while at the same time editing early Yellowstone area wildlife trapper Osborne Russell's *Journal of a Trapper*. In June 1956, Haines returned to Yellowstone for the same engineering position he had left in 1948. In 1960, Superintendent Lemuel A. Garrison, who felt the park needed a historian and was aware of the need for a centennial history

of the park, transferred Haines into a position as the park's first official, dedicated historian.

Both before and after Haines, there were other park staff, generally naturalists or seasonal employees, with historian duties. Past park historians Tony Dean, Tim Manns, Tom Tankersley, and Paul Schullery made great improvements to the collections, and Tankersley added many records to the archives. Yet after Haines retired in 1969, it wasn't until 2003 and Lee Whittlesey that the park again filled a permanent full-time historian position.

The Yellowstone Story, which had started as a hobby and collaboration between Jack Ellis Haynes and Haines, became part of Haines's job after Jack's death in 1962. Haines also began the process of assembling the park's administrative record, and it is in large part thanks to him that the park's scattered archival materials were collected, consolidated, and, consequently, protected from neglect and loss. In a letter to Paul Schullery, Haines gave this account of his archives collecting:

> *"The bulk of the boxed incoming correspondence was found in the first-floor washroom of the old Administration Office.… There, the boxes were stored on a high shelf above the john. It is my understanding that former Supt. Edmund B. Rogers had the boxes placed there after he had snatched them back from the Mammoth dump where they were to be burned. Several boxes show some scorching and I have always wondered if some did go up in smoke."*

In a 1998 interview with *Yellowstone Science,* Haines described his efforts to build upon the small museum collection that existed in the Mammoth Visitor Center from the 1920s on. It was he who recognized the uniqueness and significance of the park's military records as the only surviving records (Yosemite National Park also experienced army occupation and had similar records, but they were hauled to the dump and burned) of the army as a civil governing agent (the army is not meant to govern in the U.S. in times of peace). He set about saving them.

> *"I let it be known that I was interested in the old records, and they came in from all around.…So I gathered it all together and called it a Yellowstone archive, and it makes me happy to know that this unique collection is now a unit of the National Archives."*

NARA

Yellowstone is the only NPS site that has reached an agreement with the National Archives and Records Administration (NARA) to have the park's archives granted affiliated status: a testament to their significance. This means that although many of the park's official records, the historic photograph collection, video and audio tapes, maps, and drawings are accessioned holdings of NARA, the park retains physical custody of them rather than sending them to a records center in accordance with federal procedures. This agreement was formalized in 1978.

Discussions between NARA and the National Park Service over the Yellowstone Archives began in the mid-1970s, when NARA learned of the significance and extent of the park's record collection and expressed a strong interest in taking it from the park. In the ensuing dialogues and debates between the two agencies, both Haines's great accomplishments in saving the collection and the numerous remaining shortcomings in the park's management of the collection were highlighted. It became clear that if the archives were to stay in the park (as key park staff believed they should), the care and storage of the material would need professionalizing.

Yellowstone Superintendent John Townsley (1975–1982), with a long family history in the national parks and a deep interest in the agency's history, championed keeping the archives in the park. He successfully located the million-plus dollars needed to overhaul the Mammoth Visitor Center, creating an acceptable storage facility to meet NARA standards for environmental controls and a halon fire-suppression system. A storage vault was constructed in the visitor center basement to house the archives, with professional shelving and map storage. Other storage upgrades brought the facility into accord with NARA requirements. Library and museum storage were likewise upgraded significantly. The interpretive elements of the visitor center were also remodeled during this same period, and a stronger emphasis placed on cultural resources and history in the new exhibits. The building was rededicated as the Horace Albright Visitor Center on September 19, 1979.

In large part, the park's agreement with NARA was finally reached because the park successfully argued that staff couldn't meet management goals and the demands of outside researchers without having its records available on site. Park projects often involve fieldwork as well as research in the archives, and the ability to achieve both in the park is an opportunity cherished by both staff and researchers.

PAUL SCHULLERY

In 1976, Richard Russell, then NPS archivist for the Harpers Ferry collection, came to the park. He and Paul Schullery overhauled the archives's storage box system. Records were moved from old, army-era file boxes and cardboard cartons into Hollinger acid-free boxes, a significant improvement.

The agreement requires that the park's records be managed and cared for under NARA's standards, and made available to the public. The NPS must provide trained professional staff to care for and manage the archives. The park currently has a term (four-year position) archives specialist, Harold Housley, who has worked in Yellowstone's archives since 1999. In the past, the park has had a permanent full-time archivist on staff; Lee Whittlesey held that position from 1997 to 2002.

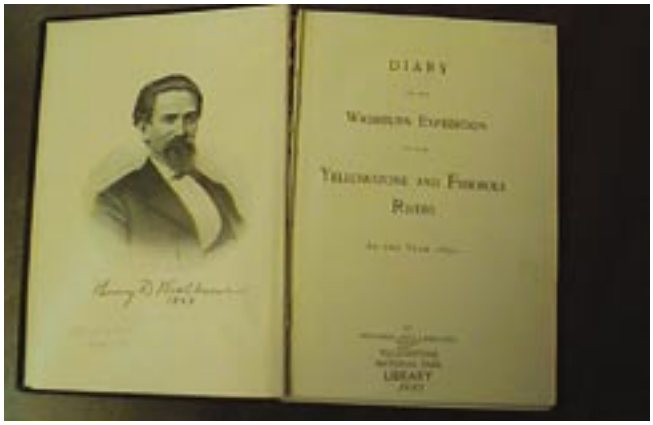
Other collections staff currently include a permanent full-time supervisory museum curator and a historian. Full-time librarians are currently funded by the Yellowstone Association. In addition, term and seasonal museum, archives, and library technicians work on special projects as funding allows, and are assisted by an assortment of volunteers, interns, and Student Conservation Association resource assistants.

The Collections Today

Today, Yellowstone National Park's collections consist of the museum, archives, and research library. The museum collection includes more than 300,000 objects, cultural artifacts, and natural science specimens and their data from disciplines that include history, archeology, ethnology, biology, botany, geology, and paleontology. There are wildlife specimens of park fauna including study skins, taxidermic mounts, insects, reptiles, and amphibians; a herbarium of park flora; rocks and minerals; vertebrate, invertebrate, and botanical fossils; Native American artifacts; historic vehicles; historic hotel furnishings, souvenirs, and ephemera; original works of art; postcards; and more than 90,000 historic photographs and negatives. *(For more details on some of the weird and wonderful pieces in the collection, see the sidebar, "What's in There?".)*

Some of these objects are exhibited throughout the park in visitor centers and museums; the rest are now in the HRC. Thousands of other objects reside in universities and museums throughout the U.S. and abroad (Table 1 lists some of these repositories), including items such as soil samples, geologic

(continued on page 14)



Nathaniel P. Langford's 1905 reconstructed account of the 1870 Washburn expedition to the park.

Table 1. Some Other Repositories Containing Yellowstone National Park-related Collections

Autry Museum of Western Heritage: Fred Rosenstock Collection, Los Angeles, California (photographs, poster art, general West)

Buffalo Bill Historical Center: McCracken Research Library, Cody, Wyoming

California Museum of Photography: University of California–Riverside, Riverside, California (Keystone-Mast Collection of approx. 350,000 glass-plate stereoscopic negatives and photographs taken from 1890 through 1935. Includes many Yellowstone images once owned by the Keystone View Co.)

Curt Teich Postcard Archives: Lake County Discovery Museum, Wauconda, Illinois

Gallatin County Historical Society: Pioneer Museum, Bozeman, Montana

Library of Congress: Prints and Photographs Division, Washington, D.C.

Minnesota Historical Society: St. Paul, Minnesota (Northern Pacific Railroad archives)

Montana Historical Society: Photograph Archives, Helena, Montana (Haynes Foundation Collection of original photographic negatives by F. Jay and Jack Ellis Haynes, former official photographers of Yellowstone National Park)

Montana State University: Renne Library, Special Collections, Bozeman, Montana (Haynes Family collections, including research files and business records of J.E. Haynes; David Pierson papers (Lamar Buffalo Ranch); Gustavus C. Doane papers; Victor Chestnut papers, containing original transcript of diary from Folsom-Cook Expedition)

Museum of the Rockies: Montana State University, Bozeman, Montana (photographs, ephemera, artifacts, fossils)

Museum of the Yellowstone: West Yellowstone, Montana (wildlife, history, transportation)

National Archives and Records Administration (NARA): Still Picture Reference, Special Media Archives Services Division, College Park, Maryland (paper records from Yellowstone National Park; William Henry Jackson and U.S. Army photographs)

National Park Service: Harpers Ferry Center, Office of Library and Archival Services, Harpers Ferry, West Virginia

Old West Museum: Cheyenne, Wyoming

Union Pacific Railroad Museum: Council Bluffs, Iowa (Union Pacific Railroad photographs, publications, artwork)

U.S. Geological Survey: Photographic Library, Denver, Colorado (William Henry Jackson & J.K. Hiller photographs, USGS Yellowstone work: 1890–1950)

University of Chicago: Dept. of Botany, Chicago Special Collections: "American Environmental Photographs, 1931–1936" (Photographs from 1926 International Congress of Plant Sciences Western Field Trip)

University of Wyoming: American Heritage Center, Laramie, Wyoming, and Hebard Collection, Laramie, Wyoming

Western Reserve Historical Society: The Crawford Auto-Aviation Museum, Cleveland, Ohio (photographs and vehicles)

Wyoming State Archives: Barrett Building, Cheyenne, Wyoming (photographs by Haynes, Stimson, Jackson, and others)

Yale University: Manuscripts and Archives, New Haven, Connecticut (George Bird Grinnell Papers), and Western Americana Collection, Beinecke Rare Book & Manuscript Library, New Haven, Connecticut

Yellowstone Gateway Museum of Park County: Livingston, Montana (photographs, artifacts)

Yellowstone Historic Center: West Yellowstone, Montana (photographs, documents)

What's in There?

Yellowstone's museum collection contains many unique, rare, and irreplaceable items. It also contains some weird and wonderful things. In the past, park visitors were not generally invited to view the collections due to the museum's limited space and substandard conditions. With the completion of the HRC, the public will be able to view some of the collection's treasures for the first time. The HRC has 1,600 square feet of exhibit space—something the park never had before. The Yellowstone Park Foundation funded a $55,000 grant called "Wonderland on Exhibit" so the park could purchase exhibit cases for these areas in order to showcase various parts of the collections on a rotating basis, probably every six months.

The first exhibit will include parts of the Susan and Jack Davis Collection, much of which has never been seen by the public. This collection is the museum's largest acquisition, containing more than 20,000 pieces, including several rare souvenir pieces such as Limoges china and coated specimens, procured in 2001 with the assistance of the Yellowstone Park Foundation. Thanks especially to this acquisition, the park also has one of the most comprehensive collections of Yellowstone National Park postcards in the world. Early souvenir collections will also be showcased, as well as portions of the photograph archives, some original Thomas Moran watercolors, and furniture from various park hotels. Historic vehicles will also be exhibited on a rotating basis in the HRC lobby.

A wooden trail marker.

Saddles from the U.S. Army's time in the park, and some NPS regulation saddles.

Some of the most unusual items in the collection are the early park

A pottery bean pot from the Divide backcountry cabin.

This large relief model of the park once resided in the lobby of the Grant Village Visitor Center.

This circa 1910 hand-painted Limoges bowl depicting the Lower Falls is part of the Susan and Jack Davis Collection.

A 1913 clawfoot tub from one of the park's hotels.

A drawer full of early park souvenirs.

U.S. Army Cavalry sword used by General George Anderson.

These coated specimens were early park souvenirs.

souvenirs covered with travertine. In the 1880s, Ole Anderson set up wooden coating racks in the flowing water of the Mammoth Hot Spring's terraces. Visitors could drop off or purchase an item to place on the racks. Then they toured the park, usually for five days, and as they did, their items became coated with travertine from the run-off, ready for collection upon their return to Mammoth. One of the most remarkable of these coated specimens is a straw hat. The collections also include interpretive signs that were burned or damaged during the 1988 fires as a powerful reminder of that important part of the park's history. One of the weirdest items in the collections is a perfectly level table, one of whose legs was snapped off and replaced with a deer's leg bone.

Some of the most significant items in the collections are also the most valuable, including the Thomas Moran watercolors and the collection of historic park vehicles. The Moran watercolors are one-of-a-kind sketches he produced while part of the 1871 Hayden expedition. They include his pencil notes describing the colors. Other wonderful items include the more than 90,000 historic images in the photograph archives, which document the park's natural and cultural history, and the large collection of Yellowstone souvenirs. There is also the earliest known written account of a visit to the park. In 1826, Daniel T. Potts wrote a two-page letter to a friend back East, mentioning his excursion to the area and his visits to the Yellowstone River, Yellowstone Lake, and geysers. This letter appeared in a Philadelphia newspaper, and was also probably the earliest written account of Yellowstone's thermal features ever published.

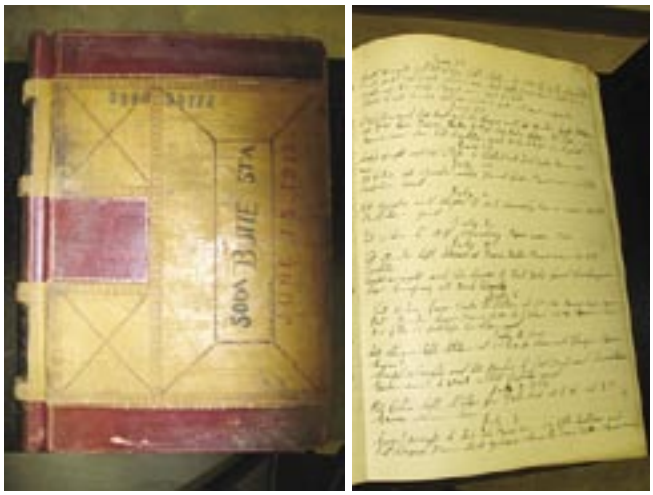
A decorated Native American spoon with a bowl made of horn.

A wood stove from Fishing Bridge, probably from staff housing.

specimens, thermophilic microorganisms, insects, plants, and wildlife specimens. In the early days of the park, explorers and researchers collected many of these items and often gave them to outside repositories, such as the Smithsonian's National Museum of Natural History, but many items were kept in personal collections as well. Today, items collected by researchers must be reported to the park, and they remain federal property. They are accessioned into the museum collection or loaned to a designated repository at the park's discretion.

The archives contains nearly 3,000 linear feet of documents. Records are grouped into 13 series representing various park administrations and concessioners, such as the U.S. Army administration from 1886–1916, the NPS from 1916 to today, the Yellowstone Park Company (a park concessioner) from 1900–1980, and records from the 1988 fires. The archives also contain park-related ephemera, oral histories, audio and videotapes, and historic film footage. There are hundreds of fascinating documents tucked away in the archives, including many letters bearing original signatures by Theodore Roosevelt, George Bird Grinnell, John Yancey, Philetus W. Norris, and others prominent in Yellowstone history, as well as the original handwritten logbooks and scout's diaries kept by the U.S. Army as they patrolled the park.

The research library contains more than 20,000 volumes covering all aspects of the park and its history, including periodicals; theses and dissertations; manuscripts; maps; microfilm; videos; drawings; weekly, monthly, and annual reports by the park superintendent and various divisions; and a rare book collection. The rare book collection includes such treasures as Ferdinand V. Hayden's 1872 *Preliminary Report of the United States Geological Survey of Montana, and Portions of Adjacent Territories*, which was the first published report on Yellowstone documenting his 1871 expedition. In 1998, Dean Larsen of Provo, Utah, donated William Strong's 1875 *The Yellowstone and the Great Geysers* to the park. Only about 12 copies were made, but this book is one-of-a-kind, as it was Strong's personal copy and includes letters from General Philip H. Sheridan and others that were bound into it. Carl E. Schmidt's 1910 *A Western Trip,* an account of a trip to Yellowstone in fall 1901, also resides in the collection, which continues to grow. The park acquires on average 1,000 items for the collections each year that staff must conserve and interpret.



NPS/HAROLD HOUSLEY

Some of the most fascinating items in the archives are army-era logbooks, such as this one from Soda Butte Station, 1913–1918. They contain soldiers' handwritten accounts of their patrols, including wildlife and weather observations.

It is important to remember that all of this was housed in the basement of a nearly 100-year-old building in less than 3,000 square feet of space, with overflow recently housed in eight other Mammoth and Gardiner area buildings. In addition to this appalling paucity of space, the collections' former home, never designed to house a modern-day museum and archives, was also prone to occasional accidents *(see sidebar "Some Near Disasters").*

Planning for a New Facility

As the collections continued to outgrow their space in the Albright Visitor Center basement, both in terms of room for items and researcher work space, the facility also became the subject of a 1989 on-site audit by the Office of the Inspector General. The audit found many serious deficiencies in the park's collections storage, including overcrowding; inadequate environmental controls, and security, fire, and flood protection; and high levels of radon. Yellowstone received a citation for the poor preservation conditions of its museum and archives collections, and staff safety became a concern. Laura Joss, as NPS Rocky Mountain Regional curator from 1990 to 1994, pushed Yellowstone throughout her tenure to correct the audit deficiencies.

In 1990, staff made efforts to remedy heating problems, radon levels, and pest infestations, but by 1991, the park had identified the need for an improved collections storage facility. In 1992 and 1993, staff studied the possibility of rehabilitating the Mammoth powerhouse for such a use, as it was no longer used for power generation and had been empty for many years. In 1994, Laura Joss became Yellowstone's first branch chief of cultural resources (1994–2000), and she was immediately tasked with the museum storage facility project. Of great assistance to her throughout the early planning stages were National Capitol Regional curator Pam West and Intermountain Region staff curator Matthew Wilson. That same year, the park selected HRA Associates, Inc., of Missoula, Montana, to provide architectural and engineering services for a refurbished storage building. They subcontracted with historical architect Jim McDonald to perform a study and prepare a report.

In 1995, staff found more badly needed storage space for the park's growing collections, and further addressed some of the deficiencies in the Albright Visitor Center listed in the 1989 audit. Staff revised Jim McDonald's study to include the evaluation of needs for storage, research, and exhibit space,

Some Near Disasters

In some ways, the park was simply lucky to have safely housed the collections for so many years in the substandard conditions in the Albright Visitor Center. One near disaster for the collections occurred the day after Christmas in 1978. According to Mary Meagher, she received a call from Linda Young, then curator, saying that some pipes had broken and the visitor center basement had flooded. Mary called for help, got master keys, and called the supply office to ask that they collect every wooden clothespin they could find. She, Linda, and Valerie Black ran wet historic photo negatives through a chemical bath and hung them up with clothespins to dry. Wet glass plate negatives were balanced on top of matchsticks at each corner and left to dry. Working like this, they saved almost everything; only one or two glass plates were broken.

On December 24, 1998, just before museum staff left for the day, a water pipe burst in the basement boiler room, right next to the archives. About two inches of water already covered the floor, reaching some valuable records and maps. Rising water threatened the elevated map cabinets and storage units. Staff turned off the water, cleared a clogged drain, and went to work with mops, buckets, a wet/dry vacuum, fans, squeegees, and space heaters. Using blow dryers, staff salvaged some of the damaged materials, but there was some damage to and loss of paper records and maps. After the holidays, drains and pipes were repaired, water alarms were purchased, and staff prepared plans to address future disasters.

On May 23, 2000, a sewage backup in the visitor center pipes overflowed a drain in the archives. Raw sewage and gray water splashed onto and flowed under some shelving and cabinets containing archival materials. Staff were working at the time and rescued the collections, but some storage equipment was damaged. The same day, the rare book room in the library flooded due to a bathroom faucet that had been left open while the water was shut off in the building. When the water was turned back on, it flooded down the walls into the rare book room. Again, staff were present and able to rescue the collections before any damage occurred.

The Horace Albright Visitor Center, home of the collections from the 1920s until 2004.

and the consideration of alternative Mammoth area buildings. The study also drafted plans and projected costs for a brand new facility that would meet the needs of staff, visitors, and researchers. When the study was completed in 1996, the powerhouse option was dropped for lack of size and public accessibility. Staff considered various plans for improved and larger storage areas, but all of the buildings were found to be either too small or too expensive to retrofit. Another idea dismissed in early discussions was the combination of a collections storage facility and visitor center, due to the sheer size necessitated by such a building, as well as funding issues. At that time, there were funding options available for a collections storage facility, but not for a visitor center or a museum. Laura Joss wrote a proposal for a new facility and submitted it to the NPS Line-Item Construction Program. The park contracted with Barker, Rinker, Seacat & Partners Architects, P.C. (BRS) to produce draft designs for a new facility using Jim McDonald's study.

In 1997, staff named the new facility the Yellowstone Heritage and Research Center, and the site being considered for the new building was the "Ice House" site, to the northwest and across the street from the Post Office in Mammoth. All of the areas being considered for the building in the Mammoth area underwent subsurface core testing due to the underlying travertine and the area's seismic activity. Ground-penetrating radar tests were conducted in 1997 through a cooperative project with the University of Montana to determine surface stability and identify the presence of faults or thermal features in these areas. By 1998, architectural drafts of the building were being reviewed. The park also explored funding options with agencies and outside partners as well as the possibility of sharing facilities, but off-site storage was soon considered to be untenable. SK Geological Corporation completed subsurface testing for three possible Mammoth building sites (Ice House, Mail Carrier's Cabin, and the parking lot south of the Yellowstone Center for Resources building), but the sites were found to be either too small, or made up of decomposed travertine, where basement construction is discouraged. The Ice House

site had one area considered to be an excellent building site, and another, comprised of unstable bentonite, to be avoided. There were also growing concerns that such a large building in Mammoth would adversely affect the Fort Yellowstone Historic District.

Yellowstone's funding request to the NPS Line-Item Construction Program was accepted in 1999, setting up the park to receive funding for construction in 2002. Detailed planning therefore began in earnest, with Native American consultation and discussions with area museum partners on alternative sites and building designs. Sites under consideration at this point were the Ice House site in Mammoth, Gardiner depot, and Gardiner gravel pit. Throughout the planning process, the park considered approximately 25 sites or buildings that could have been adapted for use.

Museum curator Susan Kraft (1994–2003), took over the project after Joss left to become Superintendent of Fort McHenry National Monument in 2000. That year, the Gardiner gravel pit site was chosen for its stable subsurface as well as for its ability to accommodate the size and future expansion of the HRC. The park commented on preliminary building designs, and then chose CTA Architects of Billings, Montana, for architectural and engineering services. Staff decided to phase in the building program, as the available line-item construction funds would not cover all long-range costs, and Phases II and III were postponed. Staff revised and submitted proposals to fund the remaining phases to the Yellowstone Park Foundation and the Save America's Treasures program. The regional curator from the NPS Capital Region and one of the nation's top environmental engineers advised the park on space needs and environmental requirements for the new building. Late in the year, Sue Consolo Murphy became the next branch chief of cultural resources (2000–03), and continued overseeing cultural resource staff input into finalizing plans for the building's design.

In 2001, the NPS Development Advisory Board approved $6.1 million in NPS line-item construction funds for the first phase of construction in 2002, and some funds were immediately available for planning. Regional curators and NARA representatives reviewed preliminary designs. The environmental assessment (EA) was released in early 2002, and the park held a public open house in Gardiner, Montana, to collect comments on the EA. Staff from all park divisions, and many other interested parties, such as the Montana State Historic Preservation Office, were involved in the planning process. Comments received included support for the new building, and interest in more displays of the collections. One commenter wished that more of a museum had been planned. Some comments, though, expressed concern about the size and look of and lighting for the building, as well as its location close to the school and wildlife habitat. *(See sidebar, "Why Does it Look Like That?".)* The building is located in pronghorn habitat that was disturbed and is being revegetated for a net positive gain.

The HRC's Design and Construction

The design of the HRC building is vaguely reminiscent of the National Archives in College Park, Maryland, especially in the picture windows and overall warehouse look. In the National Park Service, there are no other buildings that are comparable in either appearance or purpose. The Western Archeological and Conservation Center just moved into a large building that is one of the newest in the NPS; however, they rent the space. The Museum Resource Center in the National Capital Region also has a large, new facility with state-of-the-art storage like the HRC. However, the HRC is one of the largest such facilities in the NPS and will most likely be used as a benchmark for other parks with large collections.

The functions of the HRC are twofold: to properly warehouse the collections, and to provide space for academic pursuits. Therefore, it was designed to evoke the sense of both a storage and a research facility. The inspiration for the design came from the turn-of-the-century Yellowstone Park Transportation Company buildings in Gardiner, although the HRC's design is purposely more academic. This mix of architectural designs is intended to help the public avoid confusing the building with a visitor center or lodging facility. Exterior materials were selected to be durable and low in maintenance, and to infuse the building with a sense of history and longevity common to significant NPS structures. The basalt stone veneer was designed to link the building to the nearby Roosevelt Arch, which is also made of basalt, and the Arch Park pavilion. Designs took advantage of the contours of the gravel pit site, so the HRC appears to be only two floors from the front, but three from the back.

The building was designed and constructed to be sustainable and energy efficient, incorporating passive solar heat. Environmental sensitivity was emphasized during construction, including resource conservation, recycling, and the use of non-toxic materials. Whenever possible, the products used were recycled, low in volatile organic compounds, minimum energy, and durable. The plumbing system was designed to

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NPS/VIRGINIA WARNER

The cantilevered devices over the windows provide two functions. They screen the glass from the high summer sun so that the interior spaces do not overheat. They also bounce natural daylight off a reflective top surface deeper into the building, so there is less demand for artificial light during normal working hours.

PHOTOS THIS PAGE NPS/VIRGINIA WARNER

Why Does it Look Like That?

Change is often difficult to accept, and unsurprisingly, not everyone is thrilled with the placement and look of the HRC building. It has stimulated considerable discussion among local residents and frequent visitors to the park. The building dwarfs most other Gardiner area structures. It is too far removed from its intended architectural context, the 1930s art deco concessioner warehouses that inspired its design, to achieve any visual harmony with those buildings. (That connection can be realized as one is leaving the park via the Roosevelt Arch. The HRC is seen in the distance while the Yellowstone Park Transportation structures are off to the right.) The back side of the HRC, seen from the approach to the park on U.S. Highway 89, appears taller than the front due to the contours of the site, and is essentially a blank wall. All of this leaves many to wonder, "Why does it look like that?"

First, and simply, the HRC had to be big in order to provide adequate space for the park's collections, and it was determined that it was better to gain square footage by going vertical rather than choosing a more sprawling, low-rise building. Second, the HRC is more of a warehouse than a museum—and so that's more what it looks like. Finally, in the original designs, the open spaces on the backside of the building were intended to display ceramic mosaic tiles in Yellowstone National Park-related murals, for the purpose of breaking up the mass of the building. For various reasons, this idea was dropped, leaving the back of the HRC rather plain and tall; however, the sandstone color of the building blends in well with the Gardiner area landscape, adding an aspect of camouflage to the facility.

On the other hand, one can't miss the fact that the HRC is located so that it is framed by the Roosevelt Arch—

a cultural icon in and of itself—as one exits the park. Whether or not you appreciate this placement depends on your point of view. The HRC façade is intentionally placed on an angle, not directly perpendicular to the axis of the view through the arch, to make it seem less prominent. In the recent past, that viewshed included bright yellow school busses, an old gravel pit, oil tanks, and road construction materials and equipment, along with the more distant sagebrush hills and mountains—a more open, natural view. But although Yellowstone is in large part a "natural" park, set aside for its renowned geothermal features, Yellowstone's cultural history as the world's first national park is also of great importance to the world. The HRC protects and preserves the history of "the idea" itself, as well as the many things themselves, both natural and cultural in origin. Love it or hate it, the importance of this facility to the preservation of Yellowstone's collections cannot be overstated.

Large chains hang from the roof all the way to the ground, an efficient way to move water off the roof without creating hazardous waterfalls. Chains are also incorporated into the building's interior (shown above).

use low water consumption fixtures. The lighting is primarily fluorescent and moderated by sensors, and exterior lighting is sensitive to light trespass and Night Sky initiatives. Of course, the facility also has high-level security and alarm systems. The entire building is protected by a fire sprinkler system where each sprinkler is individually activated by heat, and there is a two-hour rated firewall around the archives stack area, the rare book room, and the map room. There are two hook-up points to the water supply to reduce the possibility of a loss of water for the fire suppression system.

The HRC was designed in two horizontal zones, with the collections stored in the northwest of the building in spaces with no windows, away from direct sunlight where the temperatures are cooler and more stable, thereby minimizing the demand for mechanical heating, cooling, and humidity control. Spaces benefiting from natural sunlight and solar heat, including staff offices and people spaces, are located on the southeast side, with interior office windows placed to take advantage of natural daylight. Exterior windows are double-pane glass with low-E insulating glazing to reduce radiant heat gain and building heat loss, and to screen UV light. In summer, exterior solar screens shade the windows to reduce heat gain. The southeast corridor is a passive solar heat collector through its large windows, and its flooring is dark gray-brown porcelain tile with high thermal mass. The HRC's complex heating, ventilating, and air conditioning is accomplished by a water source heat pump, which ensures the proper humidity, temperature, and environmental requirements of the collections. This is a single pipe design, as opposed to the more conventional two pipe design, where supply water and return water are in separate pipes, so the heat pump system in the HRC uses half the copper pipe of conventional heat pump systems. This system also redistributes collected heat throughout the building, as well as storing it as hot water in an underground tank for later distribution.

The building is also designed vertically, with support spaces on the lower floor for processing incoming items, mechanical and electrical rooms, a staff break room, and a conference room. The archeologist work spaces are located adjacent to the delivery dock due to the heavy and often dirty nature of archeology materials. The main floor includes the HRC's main entrance, lobby, herbarium, and museum spaces, including the curatorial work room and collections storage, cold storage, and walk-in freezer. The third floor houses the library, where barrel vault skylights filter natural light all the way down into the lobby exhibit spaces. Artifacts enter through the lower-level delivery dock, and after a quarantine period are cleaned and accessioned, processed, cataloged, and then moved upstairs by elevator to storage. The quarantine period allows staff time to examine each item for mold and pests, such as silverfish and webbing clothes moths. If any are found, the item is wrapped in polyethylene sheeting and placed in the freezer. Once the freezing period is over, the item is returned to quarantine to be monitored for any further evidence of the infestation. Once the item is determined to be clear, it goes upstairs to its designated storage area. By cataloging everything in the processing rooms, staff hope to bring an end to the cataloging backlog.

Dick Anderson Construction of Helena, Montana, won the bid for construction, and groundwork began in October 2002. Construction was completed in spring 2004, and costs came to $6.1 million in NPS line-item construction funds, with change orders that brought the total to $6.4 million. Park engineer John Stewart, project manager for design and construction, was presented with an award for keeping the project on track and for his work to meet the many and detailed concerns of curatorial professionals.

Shelving had to be purchased, assembled, installed, and cleaned before anything could go on it.

Moving the Collections

Roger Anderson, first as acting and now as branch chief of cultural resources, shouldered the furnishing of the HRC as well as the move, along with museum curator Colleen Curry who came to Yellowstone in spring 2003. Although some items had been purchased and many funding requests had been submitted, this shiny new facility was almost completely bereft of furnishings and collections storage units, much of which had to be procured, installed, and cleaned before anything could be moved. Fortunately, some funding came in from project proposals, and many of the park's partner organizations came to the rescue. The Yellowstone Association supplied more than $109,000 in 2004–05 to furnish offices and work spaces,

Some YNP museum, library, and archives staff: Back row: Harold Housley, Steve Tustanowski-Marsh, Maria Cappozi. Middle row: Tasha Felton, Bridgette Case, David Amott. Front row: Tara Cross, Jessi Gerdes, Colleen Curry.

provide supplies, and staff the HRC with librarians. The Yellowstone Park Foundation sponsored the "Furnishing our Heritage" project, which provided the park with $90,000 to furnish the library spaces. Another large contribution came to the park's aid in the form of a bequest to Yellowstone from the Jean Mercer estate, which had set up the Mercer Endowment through the National Park Foundation. Yellowstone requested $90,000 from the endowment to assist with preventive maintenance of the park's archives and museum collections. The funds supported the purchase of specimen, art, map case, and visual storage cabinets, and a condition survey of the furniture collection, much of which is still in use in concessioner facilities throughout the park. Canon, USA, Inc., also pitched in with their "Moving the Memories" project, which donated $40,000 to the park for the purchase of modern cabinets to properly store and access the historic photograph collection, which includes photos, negatives, postcards, and other images. In all, more than $300,000 was donated.

A water jug, packed for moving.

Ella Ross, archivist at Shenandoah National Park, demonstrates how to wrap furniture for moving.

Alice Newton, left, shows others how to pack and house museum objects.

Suited up in Tyvek and respirators for working near arsenic-laden natural history specimens.

Jason Wolvington of the University of Kansas wraps a bear trap for moving.

Boxes had to be built for many items in order to achieve the specific sizes needed to protect objects.

Planning for the move was a colossal affair, and relocating the collections to the HRC was the largest NPS collections move ever undertaken. The Yellowstone Association provided funds to draw up a detailed collections move plan, and provided staff to assist with pre-move inventories. Access to the collections was restricted in October 2003 in order for staff to perform a 100% inventory, which involved checking the location of each catalog item, correcting locations, and reporting missing objects. Curator Colleen Curry and Alice Newton, Harpers Ferry museum registrar, worked to develop a plan where NPS archivists and curators from sites all across the country participated in the move (Table 2), not only to show their support for Yellowstone, but also to gain experience for their own upcoming collections moves. (Similarly, Yellowstone museum and library employees traveled to Tucson, Arizona, in 2003 to help with the NPS Western Archeological

The library—packed, palleted, and ready to move.

Alice Hart of the University of Kansas and Maria Capozzi unload objects arriving at the HRC.

Harold Housley and Steve Tustanowski-Marsh move the flammable materials cabinets.

Once things were packaged and moved to the HRC, they were unpacked and put away just as carefully.

Mergenthaler moved the Shaw and Powell safe with the help of Kelly McAdams of Xanterra, who operated the forklift.

Furniture in the museum storage room waiting to be placed on pallet racks.

Conservation Center's move, where they gained valuable training and surplus moving supplies, and made important contacts.) With Curry's assistance, Alice Newton spent 12 weeks, June 2 through August 17, training and organizing five teams of 10 people each in proper moving and packaging techniques. A senior archivist from NARA identified Yellowstone's plan as a template that other sites may wish to emulate for their own collections moves.

With the help of these teams, student interns, many volunteers, and professional movers including Mergenthaler from Bozeman, Montana, museum curator Colleen Curry and her staff moved more than five million objects from Mammoth to Gardiner. According to cultural resources branch secretary Maurine Hinkley-Cole, who assisted in the move, "they treated each object as if it were the most important historic artifact in existence, cherishing each thing as part of the great story of our park and our past." Each item was carried to a table, cleaned, wrapped in archival

(continued on page 23)

Table 2. List of HRC Moving Team Affiliations
(see map below)

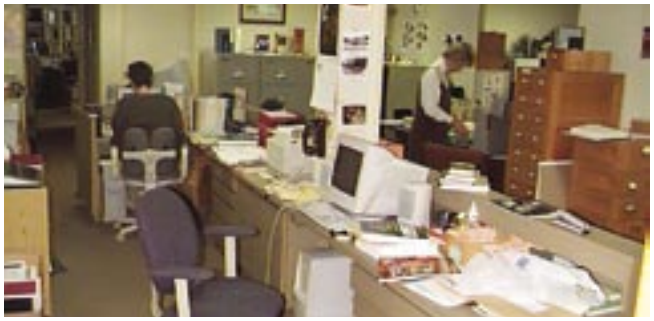
1. Alaska Support Office, Anchorage, AK
2. Allegheny Portage Railroad NHS, PA
3. Andersonville NHS, GA
4. Arlington House, Robert E. Lee Memorial/George Washington Memorial Parkway, VA
5. Cane River Creole NHP, LA
6. Chaco Culture NHP, NM
7. D.C. Booth Historic National Fish Hatchery, SD
8. Death Valley NP, CA
9. Everglades NP, FL
10. Flagstaff area National Monuments, AZ
11. Frederick Law Olmstead NHS, MA
12. George Washington University, Washington, D.C.
13. Grant-Kohrs Ranch NHS, MT
14. Harpers Ferry NHP, WV
15. Intermountain Regional Office, Denver, CO
16. Joshua Tree NP, CA
17. Midwest Archeological Center, NE
18. NPCA board member, Atlanta, GA
19. Olympic NP, WA
20. Park City Historical Society Museum, Park City, UT
21. Petersburg NB, VA
22. Salem Maritime NHS, MA
23. San Francisco Maritime NHP, CA
24. San Juan NHS, Puerto Rico
25. Sheldon Jackson Museum, Sitka, AK
26. Shenandoah NP, VA
27. Sitka NHP, AK
28. Southeast Archeological Center, FL
29. Southeast Regional Office, GA
30. Statue of Liberty NM, NY
31. Steamtown NHS, PA
32. Timucuan Ecological & Historical Preserve, FL
33. University of Kansas Natural History Museum and BioDiversity Center, KS
34. Valley Forge NHP, PA

MAP BY SARAH STEVENSON

Before

After

The days of doing research in the tiny, cozy basement of the Albright Visitor Center are over. Gone are those summer days of seeing researchers working on every available surface, including staff desks, the floor, and even outdoors. Research in Yellowstone's library will now be more of a National Archives experience, with security, good lighting, and nice wooden workstations. For some, this will be a welcome change. Others may be a little nostalgic for the way it used to be.



The librarians' desk and reading room.

NPS/VIRGINIA WARNER

The HRC librarians' desk and reading room.

The library stacks and the archivist's desk.

NPS/VIRGINIA WARNER

The HRC library stacks.

The rare book "closet."

NPS/VIRGINIA WARNER

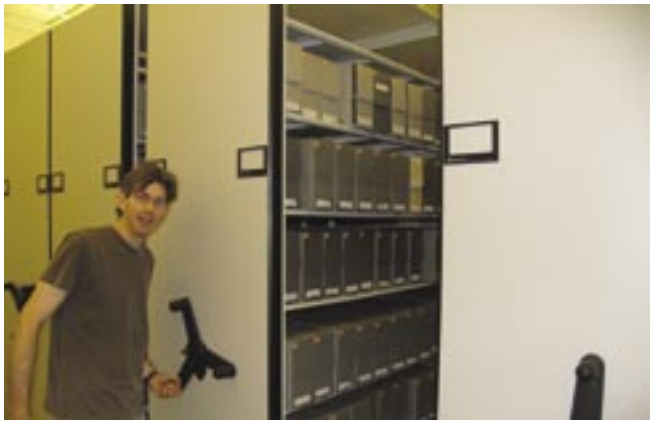
The HRC rare book room.

Before

The archives.

Map storage.

After



Archives specialist Harold Housley in the HRC archives, furnished with new, mobile, compact storage units.

The HRC map room, a work in progress. At least 12 more map cases will be ordered for this room.

tissue, bubble-wrapped, taped, and boxed. The Yellowstone Association provided the funds for most of these packaging materials. Box-spacers and archival boards were cut to exact specifications as needed to ensure that nothing was broken on its trip down the hill to Gardiner. There, the team at the HRC unwrapped and stored each object just as carefully—another 100% inventory will be completed this winter. Amazingly, nothing was broken, stolen, or lost during the move.

The HRC Today and in the Future

During an early tour of the HRC, archives specialist Harold Housley recalls engineer John Stewart stating that he thought the building would be a great place to work. According to HRC staff, this is not only true, but some even feel slightly euphoric when they enter the building. The HRC physically represents the progress than has been made and the respect for and understanding of Yellowstone's collections that has been growing for many years.

The HRC will open to the public in spring 2005. In all, the building contains the research library, a map room, and a rare book room; museum and archival collections storage; the herbarium; work space and public reading rooms for visiting researchers; conference and media rooms; lobby space for rotating exhibits; and archeology, paleontology, and geology laboratories. The offices of some Yellowstone Center for Resources staff are now located in the HRC, including museum curator Colleen Curry, archeologist Ann Johnson, historian Lee Whittlesey, writer-editor Paul Schullery, botanist Jennifer Whipple, archives specialist Harold Housley, and various librarians and technicians.

Upon its opening next spring, Yellowstone invites and encourages the public to visit, make use of, and enjoy this new facility. With the improved access and protection that the HRC provides, researchers will be better able to delve into and work on the collections, shedding new light on many aspects of Yellowstone's natural history, history, lore, and role in the world conservation movement. With a clearer understanding of and appreciation for the past, we will be better prepared to improve the future.

YS

BILL BLACKFORD

Tami Blackford is a writer-editor for the YCR in Yellowstone National Park, and has worked for the park for 10 years. She holds a BA in English from the University of Washington. She lives in Cooke City, Montana, with her husband Bill, and two children, Hayden and Kersey.

Acknowledgments

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The building itself is largely a legacy of Yellowstone Center for Resources director John Varley. He championed this project from the beginning, and it was he who put the "Research" in the "Heritage Center." The value of Paul Schullery's and Lee Whittlesey's long and ongoing work to make accessible and share the park's history with the public is immense. Credit and thanks goes to all the many curators, historians, archivists, and librarians not mentioned here, who worked hard for the collections over the years; it shows. Without the care and passion of many people, we could not enjoy the collections as they are today.

Bridgette Case and Tasha Felton in cold storage, where the park's collection of more than 90,000 historic images is stored.

Kelly Rushing, George Washington University intern, displays the Morans in their new art cabinet.

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The YS *Interview*

Park Botanist Jennifer Whipple and Yellowstone's Herbarium

NPS/VIRGINIA WARNER

Yellowstone National Park Botanist Jennifer Whipple, at the stereoscope in her new work space in the Yellowstone Heritage and Research Center.

SOME PEOPLE ARE ALREADY FAMILIAR *with Yellowstone's large museum, library, and archival collections, but may be more inclined to associate them with cultural resources such as photos, rare books, documents, furniture, and art. The collections, of course, also contain many natural history artifacts, including wildlife mounts, geologic specimens, and—another fascinating collection that also made the move to the new Heritage and Research Center—the park's herbarium. Long housed in rows of unassuming metal cabinets in various park locations, the herbarium is a treasure. Herbarium specimens document the presence of plants in the park over time, and the history of plant collecting in the park, making it an incredibly valuable resource for staff, researchers, and visitors.*

The herbarium's primary caretaker is professional botanist Jennifer Whipple, of YCR's Branch of Natural Resources. Jen's position is such a dynamic mix of natural history museum curator and practicing botanist that it was formerly included in the Branch of Cultural Resources under the museum curator, with whom she still works closely. During the summer field season, Jen makes collections and performs surveys for various park projects. She spends the winter writing reports, identifying plants, and preparing specimens. Yellowstone Science's *Tami Blackford recently plucked Jen from the flurry of the move and the summer field season to talk about plants, their preservation, and what they can teach us about the park, now and in the past.*

YS: Jen, tell us about yourself and how you got interested in plants.

JW: I was raised on a ranch in Northern California, near the Oregon border, inland, and I was always interested in natural history in general. It was pretty obvious from early on that I was into collecting things. I collected rocks, bird nests, lichens—just about anything that could walk into my bedroom, did. My mom's thing all through elementary school was, "I'll be so glad when you outgrow your collections, Jen!" There was a point, in about high school, when she quit saying it, and resigned herself to the inevitable. I got interested in plants specifically because I was trying to find out what things there were on our ranch. We had this marvelous, rocky hillside behind the house that had all these neat plants on it, and I couldn't find them in any of the wildflower guides. As I got more interested, my folks kept giving me wildflower guides for birthdays and Christmas. It turned out that the rocky knoll behind the house was serpentine, and a place of high endemism. "Endemic" is an entity that only occurs in a particular, restricted place, such as a plant that is "endemic to the state of Wyoming." The reason I couldn't figure out what the plants were, was that they were very localized endemics. By the time I knew that much, I was hooked. I was going to be a botanist by the time I was in high school. By the time I was in college, I had a collection of 900 vascular plant specimens.

YS: How did you end up in the National Park Service?

JW: When I was 9 or 10, we went to visit Lassen Volcanic National Park. I heard a naturalist giving a talk about the volcano, and decided, "I want to do that." I tried to get into the National Park Service by just putting in applications while I was in college—got nowhere—then heard about the Student Conservation Association, and so I worked for the Naturalist Division at Grand Canyon as an SCA. The next year, I put out several applications, and got a job at Jewel Cave National Monument in South Dakota. I developed a bad case of bronchitis from being in the cave—going down to about 47°, then back up to 90°+—and the doctor said that I shouldn't work in a cave again, so I needed to find a new job. I put out 33 applications to 33 national parks that winter, and the first job offer I got was from Yellowstone, which delighted me because Yellowstone was my first choice.

YS: Why was it your first choice?

JW: Yellowstone's geysers fascinated me from the first time I saw pictures of them when I was in elementary school. I was so intrigued by Yellowstone when I was eight, that I railroaded my family into taking a vacation to the park, which only increased my interest.

YS: When did you start working in the park?

JW: I started as a naturalist/interpreter at Old Faithful in the summers of 1974 and 1975. Then, in '75, I went back to get my master's degree at Humboldt State University.

YS: In botany?

JW: It actually was an MA in biology with a specialization in vascular plant taxonomy. Then I married [former Yellowstone geologist] Rick [Hutchinson] in May of 1979, and he was in Yellowstone. Anyway, I've been here ever since. I volunteered working in the herbarium for what was then called the Biologist's Office, which later became the Research Office. I started working for the Research Office as a biological technician in 1985. I was mostly [former biologist] Don Despain's seasonal employee until I got my permanent job as the park's botanist in 1993. I've been living in the park now for over 25 years.

YS: It's been said that Yellowstone reflects a diversity of environments, being "on the edge" of several ecosystems. How does the park's habitat diversity affect the types of flora found here?

JENNIFER WHIPPLE

Yellowstone's flora is generally typical of central Rocky Mountain flora.

The most unusual component of Yellowstone's vegetation is associated with the park's geothermal systems.

JENNIFER WHIPPLE

Yellow monkeyflowers growing in a thermal area at West Thumb Geyser Basin.

JW: Yellowstone is basically on the spine of the Rockies, and as a result has a rather typical flora for the central Rocky Mountains. But because we have some low elevation areas, such as the area near Gardiner, [Montana], we have elements of both Great Plains and Great Basin floras coming in and affecting the vegetation. Most of Yellowstone is, of course, a

volcanic caldera. Rhyolite flows and relatively recent volcanics do not create a highly diverse flora; the more different types of rock in an area, the more floral variation you're likely to have. The northern part of the park is probably the area that has the greatest diversity, because it has the most diversity of rock types.

The most unusual component of Yellowstone's vegetation is associated with the park's geothermal systems. The thermal systems themselves are remarkably diverse. We have systems that are very acidic, that are alkaline, and that vary in pH—and so we have some unique assemblages of species associated with these thermal areas, as well as some very interesting individual species. For example, because of the warm ground, we have populations of certain Great Basin species that may have come here in warmer climate periods and now are tied in with thermal grounds, which are the only places they're found in the park.

JENNIFER WHIPPLE

Yellowstone has species, such as Ross' bentgrass, that occur nowhere else in the world.

But the whole plant community itself is very interesting. We have rare plants that occur nowhere else in the world besides in Yellowstone. Examples are Yellowstone sand verbena and Ross' bentgrass. We are the wettest part of the state of Wyoming, stretching from the northern part of Grand Teton north and west into the Bechler area of Yellowstone, and so there are several species that occur in Yellowstone and nowhere else in the state. We also end up with things that are typically found in northwest Montana and the panhandle of Idaho that have jumped down here to Yellowstone.

YS: So part of the park's unusual floral composition is simply a result of the great size of Yellowstone, and part of it is the geothermal influence.

JW: Part of it's the size, but the geothermal aspect is the thing that makes it most interesting. We may actually have less plant diversity in the park because we've had a lot of things happen here relatively recently from a geological perspective. By the time the place gets blown up a couple of times by volcanoes and then gets scraped off with glaciers, you may have lost a lot of species that you will never know about.

YS: Why does the park have a herbarium?

JW: We have a herbarium for two main purposes: to document the arrival, extirpation, and/or persistence of plant species in the park, and to be able to identify plants. Park personnel, in general, are going to recognize the major mammal species when they see them. But because there are so many species of plants, not many people can identify those that are stuck under their nose. It's a relatively rare expertise, and there are fewer people all the time in academia (because of the increased focus directed at the molecular level of work), that can actually recognize things when they see them, either in the field or as pressed specimens. So having the herbarium and having this type of expertise here in the park is very helpful—for our own staff, other agencies, and outside researchers. The herbarium is a very valuable resource, and it's used a lot.

YS: Describe what the herbarium is.

JW: Basically, it's a collection of plant specimens. There are about 10,000 vascular plants, fungi, lichens, and mosses, etc., in the collection.

YS: What is included on a plant specimen?

JW: Typically, a plant specimen is the entire plant, including leaves, flowers, fruits (if available), and roots. The best way to handle a tree, as opposed to an ephemeral little wildflower, is not necessarily the same. Obviously, with large plants, such as trees, a specimen will be modified to include, perhaps, a branch or portion of the plant with flowers or fruits (if available). A tall, herbaceous perennial, such as cow parsnip, may take up several sheets of herbarium paper, which is 11½ x 16 ½ inches. A specimen can either be glued, taped, or actually sewn to the paper. There are various mounting methods, and some work better for one type of specimen than another. The specimen should have a label listing the name of the specimen along with where it was collected, date, and now, with GPS systems,

NPS/VIRGINIA WARNER

This herbarium specimen shows the original label, plus annotation labels that document changing opinions about the correct scientific name.

NPS/VIRGINIA WARNER

This specimen shows the parts of the entire plant. Adequate material is needed to demonstrate variation.

we'll be including the GPS coordinates. Today, a label will also generally include habitat, elevation, associated species, and perhaps rock or soil type. You also have the name of who collected it, and ideally a personal collection number. Each plant collector also maintains a field notebook that documents where they were, when they were there, what they collected, what it was growing with, and maybe the habitat type. The information in the collector's notebook is tied to the specimen by the collection number.

The collectors' field notebooks can become very important. From the collection notes of Aven Nelson, who was a professor at the University of Wyoming at the turn of the century, and a very important botanist in the Rocky Mountain West, we can get a feeling for how common some of the weeds were in the park when he was collecting in 1899. We have his specimens of this particular type of falseflax (*Camelina sativa*), and his collection notes say, "Very abundant in some places on the roadside." We cannot find that species in the park today. So we know that it was an apparently common weed along at least one stretch of the road, and what probably happened is it's been out-competed by more competitive weeds that have come in since. But the collection notebook gives some parameters of what was going on at the time. At the same time, collectors in the latter part of the nineteenth century tended to be much more casual about noting details than we expect today. One collector from the 1910s and 1920s would come in and do a major collecting trip every year, and he's got labels that say

You can look at a 200-year-old herbarium specimen and it will look much the same as a specimen mounted last year.

"Yellowstone National Park near Gardiner." That gets to be a lot of terrain. Re-locating these sites is problematic at best.

YS: Are the notebooks kept with the specimens?

JW: No, not always. Field notebooks are an important resource and are typically maintained at whatever institution a particular plant collector was affiliated with.

YS: How durable are herbarium specimens?

JW: If you've tried to make a dried flower arrangement, you know how things fall off of it through time, and it just kind of shatters into pieces. So by pressing the plants, we basically make them flat so they can be put on a piece of paper. If you handle the paper carefully, the specimen won't break or shatter much. You still have to be very careful with how you handle herbarium specimens. But the neat thing about a herbarium collection is that as long as insects or moisture don't get into it, and the specimens are correctly mounted on acid-free, 100% rag-type paper, and they're handled with the right types of glues, the specimens are very durable and can last for a long time. You can look at a 200-year-old herbarium specimen and it will look much the same as a specimen mounted last year.

NPS/VIRGINIA WARNER

Pressed plant specimens must be handled with care if they are to remain viable over time.

YS: What are herbarium specimens mainly used for?

JW: One of the most important uses of specimens is for plant identification. For example, when you bump into something out in the field and don't know what it is, you can collect it, press it, and later take it to the herbarium. Then you might go, "well, gosh, I think this is a buttercup, but I don't know what buttercup this is." So first, you run it through a buttercup key [a tool for identifying an unknown species based on successive choices between contrasting statements]. Then you go, "gee, the key asked about the length of the petals, but it's late in the year and the petals have all fallen off." So you've reached a fork in the key where you have to continue in both directions, resulting in two possible identifications. Then you can pull out both specimens, from both sides of that key, see what they look like and go, "oh yeah, *this* is what I've got, not that." Sometimes it's a lot more complex than that, because although the plants are distinct, it's sometimes very hard for us to tell them apart. The characteristics that separate them are very cryptic. It's interesting, challenging.

YS: Do you keep just one specimen of each species?

JW: Common misconception—people often think we just need one specimen of something, but all one specimen does is document the presence of that plant in one place at one time. In the case of exotic species, for example, we know from herbarium collections from before the beginning of the twentieth century that common timothy was already present in the park in 1897. That's an incredibly important piece of information. Then every specimen from that time on basically documents its spread to a different place.

Another thing is that plants don't always look the same. For instance, the common native chickweed can be more than 10 inches tall on the northern range, but it also occurs above 10,000 feet as a component of alpine tundra. At that point, it might be only an inch or two high, and the whole look of the plant, including the leaves, is different and more compact. If somebody is doing a research project in the alpine tundra, to be able to recognize the species they're going to need to see a specimen from high elevation. We can also get variation according to whether or not something is growing out in the open or under the forest. If you don't have a lot of light underneath the lodgepole forest, a plant may have a very open, sparse, growth form, whereas if it's out in broad daylight, it might be very stout. Seasonal variation is important, too. If a researcher is trying to figure out what elk are grazing in the fall, you need to have material that demonstrates what a plant looks like when it's coming into bloom, and what it looks like when it's in full seed. Additionally, a species may vary genetically at different elevations, locations, or on different substrates, so having specimens that demonstrate the range of variation in appearance is very helpful.

YS: How many plant species occur in Yellowstone?

JW: We have around 1,360 taxa in the park, including over 100 rare plants and more than 200 exotic plant species.

YS: What do you mean by taxa?

JW: We have 1,360 taxa, but we have only 1,280 species. Many of the species that occur in the park have more than one variety, or subspecies, that are also present in the park, therefore the number of entities, or taxa, is greater than the number of species. So when a botanist says the number of taxa, that's basically a way of saying that we have this many different entities that are recognized in the scientific literature. For example, sulfur buckwheat (*Eriogonum umbellatum*) has three different varieties that occur in the park. The widespread variety (*Eriogonum umbellatum* var. *majus*) has dense, bright green leaves and cream-colored flowers. The rarely encountered variety in the Upper and Lower Geyser Basins (*Eriogonum umbellatum* var. *cladophorum*) has bright yellow flowers, while another entity (*Eriogonum umbellatum* var. *dichrocephalum*) has sprawling to upright, dull green leaves and cream-colored flowers. Therefore, while there is only one species in the park, there are three separate taxa.

YS: Do you think there are still a lot of plant species that have yet to be reported in the park?

JW: Any time I see something and I don't know what it is, I collect it. I definitely have places that I target, but most of my summer fieldwork is project-related. Right now we've got

JENNIFER WHIPPLE

Short (1–2 inch) yellow monkeyflower plants growing on thermal ground.

JENNIFER WHIPPLE

Luxurious, tall (1-2 foot) yellow monkeyflowers along a cold stream.

the Inventory and Monitoring [I&M] program, and for that we need to document that we have found at least 90% of the vascular species that occur in the park. There's no question that we are over that point, but there are definitely species that are, for instance, known in Grand Teton, or out in the Shoshone National Forest, that could easily occur in Yellowstone but haven't been documented yet. During most summers in average years, we'll probably find one to 10 new species in the park, but when we are close to 10 new species, a lot of times those are new exotics. With the native species, it's probably one to five a year, and we're becoming less likely to find a lot of new things, just because we have looked more and more. But even a hundred years from now, I suspect we will still be locating new species. There won't be a lot of them, but every few years or so we're going to find something just because Yellowstone is a very big place and a lot of it is backcountry with limited access, and we just don't spend a lot of time in certain parts of the park.

Another thing is that most people assume that we know everything, that we know exactly which species occur in the U.S. and we know exactly how they're related to one another. That is a long way from the truth. Our knowledge of the flora in North America is nowhere near as detailed as it is, for instance, in Europe, where information on the flora has been accumulating for many centuries. There's just a tremendous amount we don't know.

YS: Are there any specimens that document the presence of a species that has disappeared from the park?

JW: Yes. We've got specimens collected in the latter part of the nineteenth and early twentieth centuries of plants that we cannot find in the park now. There are several possible hypotheses for this. Of course, the species may have been more common and was extirpated from the park due to construction, roadbuilding, or some other disturbance. There is also the possibility that the species was inadvertently introduced to the park and only persisted for a few years, or that a specimen could have been mislabeled and actually wasn't collected in the park. When there is only one specimen documenting the presence of a species in the park, there are questions about its validity and whether or not to include this species in the park flora.

YS: What can you tell us about the history of the plant collecting in Yellowstone?

JW: You can just imagine: Yellowstone's found, made a national park, people start hearing about the geysers, the incredible thermal features, and every botanist is going, "If I can figure out a way, I'm going to get to Yellowstone, and I can collect some plants while I'm there and justify my trip." And so a lot of big-name botanists visited Yellowstone in the latter part of the nineteenth century, and those herbarium specimens are literally all over the world in herbaria in various locations. The earliest specimens appear to have been collected in 1871 during the Hayden expedition by Robert Adams, Jr. Early collectors typically were tied to some institution, or had personal collections. Most of that early material, including the Hayden expedition specimens, was eventually deposited in herbaria back east such as the Smithsonian and the New York Botanical Gardens.

Greater Yellowstone Inventory and Monitoring Network

The National Park Service's Natural Resource Inventory and Monitoring Program is a service-wide initiative designed to help park managers acquire the information and expertise they need to maintain ecosystem integrity in the approximately 270 NPS units that contain significant natural resources. Resource inventories constitute a critical first step, informing park managers about the nature of the resources. Subsequent monitoring programs allow managers to more effectively detect changes and quantify trends in the condition of those resources. This network consists of four park units located within and around the Greater Yellowstone Ecosystem, which includes parts of Idaho, Montana, and Wyoming. These units include Bighorn Canyon National Recreation Area, John D. Rockefeller, Jr., Memorial Parkway, and Grand Teton and Yellowstone National Parks.

I think exotics are the biggest threat to the national parks.


JENNIFER WHIPPLE


JENNIFER WHIPPLE

Dalmatian toadflax (left) and musk thistle (right) are exotics found in the park.

NPS/VIRGINIA WARNER

Various floras are used to help identify plants in the Yellowstone area.

The first actual flora [an enumeration of the plants of a specific region, e.g., Yellowstone] of the park was published in 1886, by a man named Frank Tweedy, and it was remarkably accurate and complete. He did extensive collections in the park in 1884–85, and he also went back and looked at the herbarium specimens that had been collected by earlier collectors. He obviously didn't collect everything that we know about today, but his flora is a very good starting point for finding out when weeds first started arriving in the park, and baseline plant presence information.

There were a lot of collectors from that point until about the turn of the century, including some very big name botanists, like Aven Nelson, Per Axel Rydberg, and Charles Edwin Bessey. Rydberg and Bessey visited the park and collected extensively in 1897, resulting in the publication of *Catalogue of the Flora of Montana and the Yellowstone National Park* in 1900. Nelson basically spent most of the summer of 1899 collecting in the park with his brother, Elias. A botanist friend of mine was in the herbarium in Calcutta, India, and he went to pull out a North American species, *Lupinus argenteus,* which is the silvery lupine that is a very common species here in Yellowstone. He pulled it out, and the very first sheet on the pile was collected by Nelson from Yellowstone National Park. In India!

The next flora was done by [W.B.] MacDougall and [Herma] Baggley, which first came out in 1936, with a second edition in 1956. Herma Albertson was hired as a naturalist and later married then Chief Ranger, George Baggley. The most recent flora was Don Despain's, in 1975. Right now, as part of the I&M project, we're actively looking at coming out with an annotated checklist of what we know is currently in the park, because there's a tremendous amount of things that have been found in the last 30 years or so.

YS: Do you have plans to write an updated flora?

JW: Yes. The first step is the annotated checklist, which I will hopefully have done in late 2005. I've also started working on the keys for the flora, such as the rushes. I try to squeeze it in around my other deadlines.

YS: When did the park start maintaining a herbarium?

JW: Yellowstone itself didn't actually start collecting specimens routinely for a herbarium until the 1920s. The oldest specimen that is in the herbarium, I think, is from 1910. Much earlier, in 1883, President Chester Arthur, [21st President of the U.S.], visited the park. He collected some wildflowers and pressed them during his visit, but they are kept in the museum collection because of their historical significance, rather than being part of the herbarium collection.

YS: Do you add to the collection every summer field season?

JW: What we're trying to have with our collection here in Yellowstone is at least one representative specimen of every taxa that occurs in the park. We're also trying to use the herbarium to document the arrival and spread of exotic species, so our current collecting is actually somewhat biased toward exotics in order to document what is happening, because it's a huge problem. I think exotics are the biggest threat to the national parks. People tend to look at Yellowstone as this wide-open, pristine wilderness, but the whole look of it has changed from 200 years ago.

We are also trying to pick out the holes that we currently have in our collection and make an effort to collect those species. A lot of the people who collected for the herbarium in the early years tended to collect the showy species—the wildflowers. We're trying to make sure that we have an even coverage of the sedges, the grasses, the things that most people don't tend to look at carefully, which actually, from a Yellowstone perspective, are some of the more interesting plants in the park. The Bechler area has been undercollected, partly because botanists don't like getting their feet wet much more than anyone else. But I've found more new records for the park, often, by getting out and getting wet. My boots sometimes never dry out, and my feet start smelling like rotting boots. I have even gone swimming to collect plants. I actually swam out to a beaver lodge once to see what was growing on top of it and found a species not yet reported in the park.


JENNIFER WHIPPLE

Warm springs spike-rush, a rare plant, in a thermally influenced wetland.

YS: Are people doing plant research in the park supposed to provide you with voucher specimens collected during their research?

JW: Yes. There is a tremendous amount of park material that has been collected, since even before the park's establishment, and lies scattered in institutions all over the country. Regretfully, Yellowstone, as well as other parks, has no way of tracking all of this material. Because of this, today, anything that's collected in a national park is legally the park's property, and everyone, including me, needs a collecting permit. The storage location of such specimens, however, is a decision between the park and the investigator. With the additional storage space now available in the HRC, we will be able to accept many more voucher specimens than before.

YS: When you get voucher specimens, where do you store them?

JW: They are stored right along with the regular specimens, and marked as having been collected for so-and-so's particular project.

YS: How is the herbarium organized?

JW: There are a couple of different, traditional ways that plant specimens have been organized in herbariums. One has been according to what was considered the best guess of evolutionary relationships, though different experts had different schemes. Because of this confusion, for small herbaria, like Yellowstone's, the easiest thing to do is to have it alphabetically organized by plant family, genus, and species. That's how we've had our collection organized for the last 20 years. Say a researcher comes in and would like to see all the material of Ross' bentgrass, which is an endemic grass only known from the thermal areas in Yellowstone. It's all stored together, no matter when or by whom it was collected. Therefore, a researcher can immediately locate all the material that we have for that species.

> You can now use techniques similar to DNA-fingerprinting that provide a better understanding of how some disparate plant groups are related to each other.

YS: Do scientific plant names stay stable enough over time to prevent confusion?

JW: The reality is that there's a lot of variation in how things are handled, for instance, state-to-state, because the different state floras were written by different authors who didn't necessarily agree on species delineation or correct nomenclature. Let's take bitterroot, which is the state flower of Montana and was a very important food source for some Native Americans. The bitterroot here in Yellowstone typically have petals that are bright, bright pink. If you go to Craters of the Moon, not that far from us [in Idaho], to our eyes, the petals are white. If you go through the whole distribution of bitterroots, sometimes the plants are upright when they're in bloom, sometimes the blooms are on the ground, but virtually everybody agrees that this variation is within the concept of *Lewisia rediviva*. The classification of many species, though, is quite controversial, with different treatments being routinely used by different experts.

Another really interesting thing happening right now is the explosion of new information from genetic techniques.

Park naturalist Arthur Hewitt, working in the herbarium in 1958, when it was located in the Albright Visitor Center basement. Behind him are beautifully made wood herbarium cabinets, in contrast to today's metal cabinets, which are designed to be more insect-proof. These wooden cabinets were likely custom made in the 1930s, as the park started to increase the quality of the care of its collections.

NPS/VIRGINIA WARNER

Pressed plant specimen storage in the HRC.

You can now use techniques similar to DNA-fingerprinting that provide a better understanding of how some disparate plant groups are related to each other. The most important resource previously available for understanding evolutionary relationships between plants were the flowers, but flowers are very rarely preserved in the fossil record. This lack of evidence has forced botanists to depend primarily on analyses of contemporary species, and to make guesstimates about what the relationships are between different flowering plants. The information coming in from these genetic methods is changing how we're looking at some of the plant families. The demarcations of some plant families that have been very constant for the last century or so are becoming more plastic. That's going to present an interesting conundrum about how specimens are arranged in herbaria. There's going to be a lot of flux for quite a while as more and more information comes in.

YS: Where was the park herbarium stored over the years?

JW: I'm not sure exactly where it started out, but according to Mary Meagher, [retired research biologist who was museum curator from 1959 to 1968], it was in the central area of the basement of what is now the Albright Visitor Center from at least the 1930s. After Mary arrived, the herbarium moved to the second floor in the same building. Later, the herbarium moved to a different building, then to the third floor of the administration building, where it was located until the 1990s. In 2000, the herbarium moved to the Yellowstone Center for Resources building. And, of course, this summer, it has moved to the HRC, where we hope it stays for a long, long time.


NPS/VIRGINIA WARNER

Mushroom storage in the HRC.

NPS/VIRGINIA WARNER

Fungus specimens, such as these mushrooms, are handled and stored differently than pressed vascular plant specimens.


NPS/VIRGINIA WARNER

Lichen, mosses, and liverwort storage in the HRC.


NPS/VIRGINIA WARNER

A moss specimen.

YS: Why was the herbarium moved to the HRC? I've heard it referred to as a "working curatorial collection."

JW: The herbarium is actually a part of the museum collection, and specimens are accessioned and catalogued into the museum collection just as any other museum object would be. However, the herbarium is kept separate from the main museum collection in order to allow for the unique uses that are particular to herbaria. Not only is the collection active, but NPS personnel, the public, and outside researchers need to have and are allowed easier access to the specimen than is usual for museum objects.

The new facility is a fantastic improvement for the herbarium.

YS: In your new space at the Heritage Center, do you have room for at least 25 years of growth in the herbarium collection?

JW: Yes. Definitely. The herbarium space has been so constrained for so long that we've pretty much had to focus only on vascular plants, because that was where we had the most use going on, and the most need. But we've got a collection of bryophytes, which are things such as mosses and liverworts, lichens, and we also have fungi. We even have a few specimens of algae. Now, we're going to be able to expand our lichen and bryophyte collections, and start a conifer cone collection, which we've never had. So we'll be able to fill in some of the holes that we haven't been actively collecting for, because we just didn't have space to store them.

YS: Are there other advantages to your space in the new building?

JW: Yes, one important improvement will be that the collection will be better protected. As I mentioned before, the two things that can really foul up a herbarium collection are insects and flood events or water damage. Hopefully, we can keep the second from happening. The first one is an active problem; we have gotten insects into the collection at least twice in the past. The second time happened while I was here. Swallows were nesting all around the administration building, and the bed bugs started marching two-by-two and dropping on employees' desks and stuff. So they fumigated the whole building for the bugs and that, fortuitously, also annihilated the insects in the collection. We have just moved the whole collection, and we have no idea whether or not we've got bugs in there. I hope we don't. We keep sticky pads in the individual cases so if something starts crawling around, we can just check the sticky pads to determine their presence. Hopefully, with the new facility, nothing will be able to get in.

The most exciting aspect of the new building, though, is the processing space. We have a vegetation lab room downstairs where we can store plants while they're drying, and keep our field-related gear. Fresh material is not allowed upstairs to reduce the chance of an insect infestation. Upstairs in the herbarium storage, we'll be able to set up a processing line and store things in all stages of processing, which we haven't had room to do before. We've been able store things, but we haven't been able to spread out and actually mount specimens and process them into the collection. This is why we have a backlog of 2,000–3,000 specimens. And now we're going to be able to get those specimens into the main collection and accessible to staff and researchers. The new facility is a fantastic improvement for the herbarium.

YS: Are you all moved in now and getting back to work?

JW: Not completely. There's a lot of reorganization that needs to be done, taking advantage of the additional space. We should be up and running in plenty of time for next year's field season!

YS

Packing up the old herbarium in the Yellowstone Center for Resources building in Mammoth Hot Springs.

The herbarium movers in the new HRC herbarium, which does have room for 25 years of growth in the collection.

The Bridge Bay Spires

Collection and Preparation of a Scientific Specimen and Museum Piece

Russell L. Cuhel, Carmen Aguilar, Charles C. Remsen, James S. Maki, David Lovalvo, J. Val Klump, and Robert W. Paddock

Introduction

YELLOWSTONE NATIONAL Park has served the public as a source of wonder, amazement, and education for more than 125 years, yet has far from exhausted its bounty of stunning scientific discoveries. While some may be of purely scientific interest, many are suitable and appropriate objects of public appreciation as well. Geological phenomena are particularly appealing in both the scientific and visitor arenas. Many such treasures lie discretely hidden below the frequently tumultuous waters of Yellowstone Lake (Marocchi et al. 2001), and it is clear that numerous revealing features have yet to be discovered. An incidental observation by National Park Service (NPS) archeologists in 1996 has been systematically pursued during the last five years to finally produce a specimen of probable hydrothermal origin that will provide awe and insight to scientists and visitors alike.

That Yellowstone Lake harbors intriguing hydrothermal features should come as little surprise to anyone. Walking, for example, on the West Thumb Geyser Basin boardwalk, it is not difficult to imagine Fishing Cone as only one of a complex of underwater bubbling pots and geysers. Likewise, the smoking, malodorous beaches of Mary Bay only hint at the wealth of active vents under the surface, though vigorous bubblers are clearly visible only a few yards from shore. Nor are all of the interesting features active today: in fact, there is much to be learned from relict structures that shed light on past geological processes. However, the harsh conditions of Yellowstone Lake's geothermal regions have restricted access to only a few experienced and persistent groups of explorers. In 1999, active collaboration between the NPS and a long-standing program of the University of Wisconsin–Milwaukee Center for Great Lakes Studies (CGLS), Marquette University (Milwaukee), and remotely operated vehicle (ROV) contractor Dave Lovalvo succeeded in bringing one of the lake's secret riches (literally) to light.

EASTERN OCEANICS AND CGLS

Backlit by green sunlight at depth, a solitary spire emerges from the turbidity at Bridge Bay in 1996.

Discovery of the Spires

The story began with a team of NPS archeologists searching parks nationwide for relicts of previous area inhabitants. During their 1996 acoustic surveys for submerged artifacts in nearshore areas, they ran across an unexpected series of shallow depth soundings in about 60 feet of water near the Bridge Bay marina. Alerted by these scientists, the CGLS team went to the site to investigate. The Bridge Bay area had received little attention because of its apparent lack of active hydrothermal venting, but the plot from the depth sounder piqued our curiosity (Figure 1). A seemingly straight line of tall features jutted abruptly out of an otherwise featureless plain, much as some geysers of the Old Faithful area protrude from barren landscapes. The form was much more suggestive of accretional (building up) rather than erosional (wearing down) action, possibly during long-past geological activity. Using one of the last dive days of the season, Tony Remsen, Jim Maki, and Dave Lovalvo deployed the ROV from the NPS research vessel *Cutthroat*. Their first dive landed near enough to the structures for rapid visual investigation.

The visuals were stunning. Through the dim green "fog" of somewhat turbid nearshore water, ghostly shapes emerged; up close, it suddenly became obvious that they were towering columns of hard rock. Among the lot, graceful individual spires

Figure 1. Bridge Bay spires are clearly visible on 1996 depth sounder charts from the R/V *Cutthroat*.

loomed on the monitors like stalagmites, with clusters of spires resembling ancient castles interspersed among the string. In the camera's lens, the structures varied from mere nubs to towers over 15 feet high, many covered with luxuriant growth. Well infused with natural sunlight at this depth (45–60 feet), large populations of algae covered the sides and tops of the spires. A variety of animals, including colossal examples of freshwater sponges, also made the spire surfaces home (Marocchi et al. 2001). As is common in the Yellowstone Lake geoecosystem, the spires' organismal encrustation hid the true nature of the underlying features. To understand what had been found, actual physical samples were going to be necessary. Likewise, the area required some level of protection, as evidence of damage (possibly from boat anchors, for example) was found during the initial video observation. A no-anchor zone was established by the NPS, followed by negotiations to raise a piece of the spire field for scientific investigation.

Operating under a new, two-year grant from the National Science Foundation (NSF) in 1998–99, the CGLS team worked with NPS representatives to establish a procedure for obtaining and investigating a spire sample. Collecting even a small intact structure was well beyond the capabilities of the available ROV. Yellowstone National Park resource management coordinator Dan Reinhart agreed to arrange an expedition of NPS divers to collect a specimen in the late summer of 1998. However, due to scheduling constraints, the dive would have coincided with the last working day of the group, which would have endangered satisfactory preparation of the sample for transportation and analysis. The collection was postponed until the 1999 field season.

The spire fields and underwater vent work of the CGLS group expanded to include involvement by the U.S. Geological Survey (USGS) and their associates. The USGS group, led by Drs. Lisa Morgan and W.C. "Pat" Shanks, had already done extensive mapping of Yellowstone Lake's magnetic properties. Further inspired by the Bridge Bay structures, they mounted a detailed survey of bottom topography during the summer of 1999. The first transects, in the northern basin area that includes Mary and Sedge Bays, led to the discovery of many more, significantly larger, and extensive spire fields reaching to 100 feet tall (Elliott 2000). These observations enthused the group all the more about collecting a sample for study. Yellowstone staff likewise wished to obtain a display specimen.

Collection of a Spire Specimen

Late in the summer of 1999, their wishes were fulfilled. On a somewhat dreary, overcast day, Dan Reinhart and NPS divers Wes Miles, Rick Mossman, and Gary Nelson boarded a landing-craft-like vessel captained by Dave Hall and headed out with the *Cutthroat* to the Bridge Bay site. Observers from the CGLS team and the USGS were also aboard. Once the features were located by sonar, the divers donned their cold-water gear (Figure 2), slid delicately off the bow into the water, checked their underwater cameras, and descended into the murky deep. From above, we could follow their progress by the trail of bubbles. Twice they surfaced—once with bags of water collected next to the base of a spire, and once bringing small pieces of "spire rubble" from scraps possibly damaged by previous anchoring. The spongy, porous, fragile fragments aroused substantial excitement: these were not at all like the hard vent pipes we had so often collected with the submersible! Clearly, different mechanisms had been involved in the creation of these spires.

Then, somewhat disappointing words came from the divers: the small intact spire they wanted to collect was firmly rooted in the muck and couldn't be budged. One more try, please! Rob Paddock quickly fashioned a rope sling that would provide support for the probably very delicate sample—if it could be freed from its ancient home. After a seeming eternity, the large air bubbles at the surface were pushed apart, first by a gloved hand, and then by a rubber-encased head, with thumbs up. The divers and boat crew struggled to lift the catch of the day out of the water and into a bubble-wrap-lined cooler (Figure 3). Much like pulling a tooth, the divers had rocked the 2½-foot mini-spire until it broke loose from confinement. The site of adjoinment to other structures, well below the sediment–water line, was evident as an exceptionally white spongy area on one side (Figure 3). What a find! The divers had a right to gloat over their day's work. Everyone present, including scientists from the CGLS, Marquette University, USGS, and NPS were anxious to examine the collection, but a rocking boat was certainly not the place to do it!

The spire was unwrapped on a desk at the Aquatic Resources Center at the park's Lake station. Maki and Aguilar picked at the nooks and crannies for leeches, worms, sponges, and samples for bacterial analysis. Shanks, Morgan, and Klump prodded chips and fragments, looking at the intriguing layered structure of the apparently siliceous (glass-like) form. All marveled at the complicated swirls of mineral deposition visible on the exterior. What mysteries would be solved, or would arise,


RUSSELL CUHEL

Figure 2. NPS divers (L–R) Rick Mossman, Gary Nelson, and Wes Miles discuss sampling plans at the Bridge Bay site.

RUSSELL CUHEL

Figure 3. In a cooler on board, the intact 2½-foot specimen exhibits a white zone of attachment to an adjacent structure near the base.

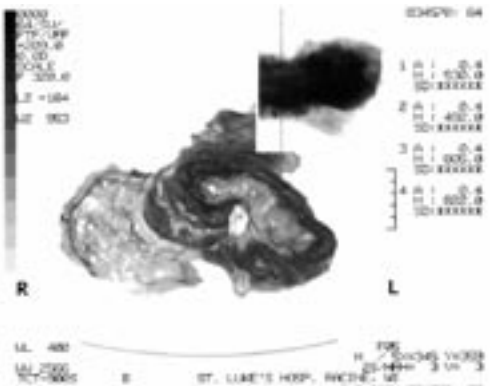
from examining the interior? Were secrets of the origin of spires and some history of Yellowstone Lake lying only millimeters away, in the center? Once again, patience was required. Even during the short evening celebration, chips dried out to amazing lightness and could be crumbled easily between the fingers. It was evident that special precautions would be necessary to ensure that everyone received an uncompromised sample for their specific uses.

The spire was obviously much stronger when saturated with water, so for transport by truck to Milwaukee, the intact specimen was heavily encased in bubble wrap and soaked with Bridge Bay bottom water. Upon return to the CGLS, there was discouraging news from the NSF: the renewal proposal for work in Yellowstone Lake had not been funded. While this did not dampen the enthusiasm for working up the year's collections, it did require a further dedicated effort to secure support for further research. During 2000, the spire waited in a walk-in refrigerator while grant-proposal writing took precedence. At last, Carmen Aguilar, with co-investigators Cuhel, Paddock, Maki, and Charles Wimpee, obtained three more years of financial support through the NSF's "Life in Extreme Environments" program. Also during 2000, Drs. Lisa Morgan and Pat Shanks of the USGS garnered funding from their own agency and the NPS to continue their high-resolution mapping of the lake bottom and magnetic anomalies. During the summer, they surveyed the area between West Thumb and Bridge Bay as well as the deep canyons east of Stevenson Island. The impetus was still strong for analysis of the spire, but how should the very fragile piece be handled? Its interior structure was still completely unknown.

Preparatory Investigations

Is there a doctor in the house? By chance, Jim Maki's wife, Kay Eileen, is a doctor with St. Luke's Hospital in Racine, Wisconsin, and they came up with the idea of running a non-destructive CAT scan to analyze density on "our baby." The anxious "parents"—Jim Maki, Tony Remsen, and Val Klump—waited in the control room as the intact specimen was examined at 5-mm intervals. Almost 150 images were obtained, providing a detailed picture of the interior density structure upon which we would base our sectioning. One such view, taken just above the sediment–water interface portion, is shown in Figure 4. Dense areas are darker, while soft, porous material is lighter in this rendering. The location of the section is shown as a line about one-quarter of the way up from the base (upper right). In the main image, the left-hand, lighter bulb is the white area in Figure 3 above, and extends to only about one-third of the height of the main spire component. The exposed edge of this section was very low-density, exceptionally white sinter with thin layers of hard, white crust meandering throughout. This portion appears almost to exude off the side of the main spire to the right. The main segment (dark oval) had a substantially denser external structure, with several nearly white circular features that might have indicated vertical conduits within the column. These possible tubes did not continue to the point of the spire; rather, they became smaller and finally vanished about halfway from the bottom.

Collectively, the images provided a pre-cutting, cross-sectional map of the spire's interior, and we opted to make four cuts to provide (1) one-half of the spire with cross-section for the NPS; (2) one quarter for the USGS for their mineralogical analyses; and (3) one-quarter for the CGLS research team. The question now was, how? It was indisputable that the material was extremely fragile. Several concerns included the use of cutting oils, binding of the spire while moving across a cutting table, and possible fracturing of the material from the stress of cutting. Because it appeared to be primarily composed of silica, we consulted George Jacobson, a glass artist at Les' Glass in New Berlin, Wisconsin. George had just produced a fabulous etched rendition of a deep-sea hydrothermal vent scene on glass shower doors for us, and he was world-renowned for his leaded glass panels and other forms of plate glass work. Given the pictures of the specimen and the goals we had set, he



ST. LUKE'S HOSPITAL, RACINE, WISCONSIN

Figure 4. An X-ray cross-section of the spire at about one-third of the length from the base (vertical line on inset) reveals spongy, low-density (lighter shades) sinter in the bulb to the left side. The adjoining main spire section shows rings of higher-density material (darker shades) surrounding sinter with possible pores or conduits (white).

instantly sent us to Scott Cole, who worked in a water-jet saw facility at KLH Industries in Germantown, Wisconsin.

During our initial visit, Scott described the advantages of the water-jet saw for our application. It consists of a fine orifice nozzle (3/64") through which a mixture of high-pressure water (55,000 pounds per square inch) and finely ground garnet is directed at the subject material from close range. Powerful enough to do filigree work in stainless steel while leaving satin-smooth edges, the instrument has several major benefits. First, there is no blade to bind on the work; the water jet cannot snag on regions of suddenly-changing composition. Second, the nozzle is moved over the work, rather than pushing the work through a cutting edge. Third, the composition of the cutting material (water) and the abrasive (garnet) are chemically pure compared to machine cutting oils, and can be readily analyzed. The water is not recirculated, so the material is not in contact with waste from previous jobs. Fourth, the material need not rest on a hard surface. The tool cuts into a large water bath with wood slats across it. The work may be placed on the wood, on foam or any softer material, or on a bed of tissue: the saw will cut through that as well. A disadvantage was that in thick material, the physical broadening of the stream with distance means some loss of material at the bottom of the cut. But watching a current job with stainless steel, we were convinced that a test with some of the larger fragments was in order.

The first test piece was a nodule about three inches thick. Although it was somewhat more dense than the spire itself, the hard mineral component seemed to have the greatest degree of difficulty. This kind of material was apparently well represented around the outer crust of the spire, based on the acoustic scans. Jet saw technician Brian Bagget helped us nestle the fragment into a foam bedding on the cutting pond, after which we discussed setup. Normally, the jet saw is fully automated. A design is read into a computer-aided design file in the computer, registration points are identified on the work, the height above surface is set, and then the program runs the nozzle through the x–y coordinates of the design, much like a plotter on paper. For our job, the cut itself was to be linear, and it was the height above base, to follow the contours of the spire surface, that had to be varied. With more than nine years of jet saw operational experience, Brian felt that manual control of the z-axis (height of the nozzle) during a constant-rate, straight-line run would work best. He would be able to keep the nozzle close to the surface, minimizing stream broadening, without having to make a large number of thickness measurements with subsequent programming. His efforts with the fragment proved his expertise. A very flat cross-section was obtained that both preserved the detail of interior pits and pockets, and maintained intact areas near the upper edge, where fractures left thin, brittle plates of mineral. A second piece of smaller size, representing the silica sinter (light, porous material), also cut very cleanly and without any "shivering" that might have obliterated delicate interior features. The demonstration convinced us that this was the method of choice. An appointment for an estimated three-hour session with the actual spire was made, and we took samples of the water and the garnet abrasive for analysis.

Sectioning of the Spire for Science and the Public

To expose the interior of the sample to best advantage while retaining an undisturbed external segment for each sample, the plan was to cut across the rough bottom, or "root," to provide a flat base and cross-sectional view. Then, the low-density silica "bulb" on the side would be removed. A subsequent longitudinal section would provide a full-length half-spire for the NPS, and lengthwise cutting of the remaining half would give the USGS and the CGLS each a representative section for analysis. Scott Cole helped set up the spire on the cutting pond for bottom removal. Using a straight-line progression, technician Brian Bagget kept the nozzle as close as possible to the work, which was especially important at the fragile trailing edges of the cuts (Figure 5). The best support was thin plywood, with a sheet of light foam packing material under the spire, because the jet cut through the support with minimum backsplash.

Anxious as we were, the first cut across the base turned out beautifully. Figure 6 shows the fidelity of the CAT scan (Figure 4, above) to actual composition, with a very low-density silica mass—the "bulb"—to the left, and the harder, apparently conduit-like structure to the right. The dark areas surrounding the orifices resemble iron sulfide precipitates; analysis is currently in progress. The sample was rotated 90°, and the low-density bulb was cut off parallel to the long axis of the specimen. Using the large, flat edge for stabilization, a lengthwise axial cut was started up the center of the main spire. Slight expansion of the jet stream made a thin but decidedly V-shaped channel, but material loss was mostly confined to the softer silica material rather than the conduit segment of greatest interest.

PHOTOS THESE PAGES BY RUSSELL CUHEL

Figure 5. The water-jet saw finishes a transverse section across the bottom of the spire with the nozzle held close to the surface of the object.

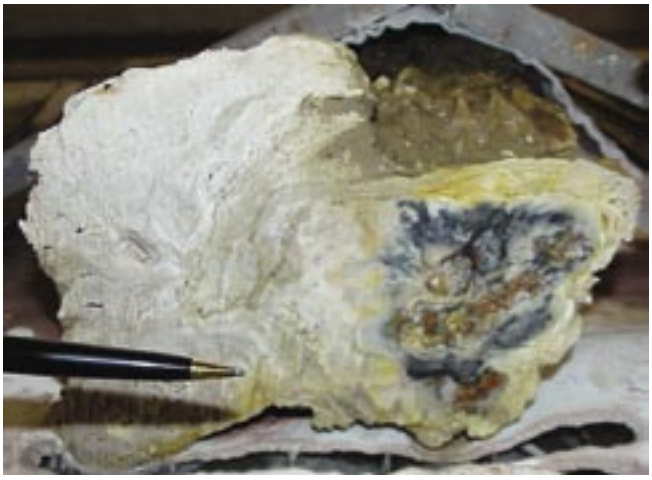


Figure 6. Cross-section of the spire viewed from the bottom reveals the porous sinter on the left and the harder main spire with dark precipitates to the right. Pen segment is three inches long.

Technician Brian Bagget carefully maneuvered the nozzle close to the specimen all along the path. The water-jet saw was especially valuable at the very tip of the spire, where the delicate silica was most susceptible to disintegration. Moving this piece through a conventional sawblade would have been a great risk to the integrity of the fine structure near the tip.

Excitement and suspense replaced anxiety as the two pieces were carefully pulled apart. Was this form the result of accretion by seepage of geothermally enriched water? Was it a product of vigorous venting through an orifice? Or was it simply mounded into shape from adjacent sediment? The first view of the interior revealed a definitive conduit-like feature extending from the base to about one-third of the way to the tip. A thin shell of hardened material surrounded a pipe plugged with granular reddish-brown material, perfectly preserved in the sectioning. A close-up of the base region (Figure 7) shows the conduit and its contents clearly, but the feature disappeared

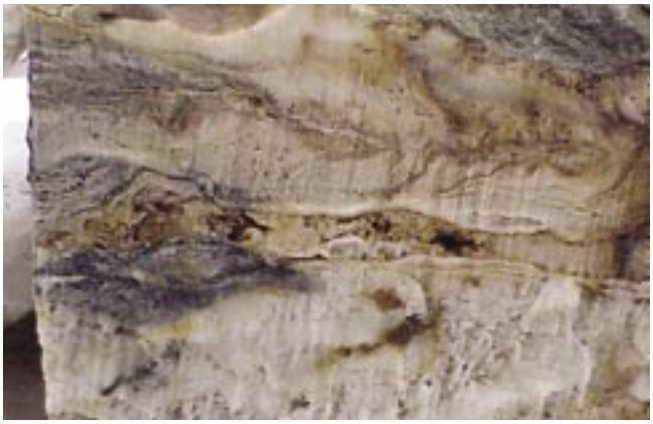


Figure 7. A close-up of the presumed conduit at the base (left) of the spire shows the thin enclosure filled with heterogeneous material.

halfway up the length of the tower. Surrounding the pipe, and accounting for most of the upper half of the spire, was more of the lower-density, silica-like material. There were bands of dark precipitate throughout the porous component, including two apparent "shells" at different distances from the exposed exterior surface. No single mechanism appeared to explain the structure; rather, it appeared as if a combination of geochemical and geophysical forces worked to shape the object. In cross-section, this half elegantly displays the interior structure of the spire, and when rotated 180°, the original view of an undisturbed specimen as seen in Yellowstone Lake is retained.

The final cut would provide the material for scientific research at the USGS and for the CGLS. The "less beautiful" of the two halves was supported over the cutting pond, and the idle nozzle run along the center of the conduit to the tip, with alignment perfected by Brian Bagget. Starting at the base, cutting this thinner section resulted in much lower loss of material on the downstream edge of the work. Each quarter-spire contained components of all of the visually apparent features for detailed investigation. Again, the tool proved valuable, as the "blade" separated two sections in the very thin, fragile spire tip area.

Final Disposition of the Sections

An exploded view of the product is shown in Figure 8. A line from the sediment–water interface can be seen clearly on the forward sections. New homes of the pieces are (clockwise from center) Yellowstone National Park, CGLS, USGS, and CGLS. Of the two research quarters, the one containing both the conduit and the adjoining section of silica bulb was sent to the USGS scientists, while the smaller quarter and disjoined bulb fragment were retained in Milwaukee. Among the many analyses underway are high-resolution electron microscopy with elemental analysis; radio- and stable isotopic age determination and geochemical formation studies; mineralogical examination, and others. Results of the combined efforts will resolve some of the mysteries surrounding the formation of the spires, as tentatively described in a *Science* "News Focus" article of mid-2001 (Krajick 2001).

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Figure 8. Spire segments arranged in exploded view as they existed in the field, emphasizing the contrast between exterior (forward, right) and interior (rear) composition.

Resource Considerations

Detailed scientific analysis is not necessary to recognize that the Bridge Bay spires are both awesome and delicate. Only

recently discovered, though probably thousands of years old (research in progress), it is now clear that there must be a balance struck between protection of the resource and access for public viewing. In the words of Yellowstone Center for Resources Director John Varley, "It would be the most spectacular part of the park, if you could see it" (cited in Krajick 2001). In the lake, the spectacular views (Marocchi et al. 2001) are shallow enough for sunlight to penetrate, but are accessible only by SCUBA diving. Even so, just the seemingly rugged exterior is visible, and it will be only through the park's eventual display of the sample that visitors can glean the complexity of the spires' long history. With the hundreds of much larger spires later discovered by the USGS in the northern end of the lake (Elliott 2000), there exist several opportunities to develop a "spire preserve." A remaining challenge might be to provide viewing possibilities without the requirement of diving, thus increasing the breadth of public access while simultaneously protecting the features from accidental or intentional vandalism. This challenge extends beyond the spires to numerous and diverse hydrothermal geoecosystems throughout the lake (Marocchi et al. 2001; Remsen et al. 2002). For example, NPS divers or ROVs might collect a video survey of spire fields that could be played at a visitor center from CD-ROM or endless-loop video. Many other scenarios may be envisioned. Certainly, the events depicted in this article have elevated the Bridge Bay spires from "mounds of rubble" to geological features containing some of the keys to understanding Yellowstone Lake's past. Research in progress by all involved agencies will serve to augment the already great contribution of Yellowstone Lake to awareness of Earth's geoecosystem functions.

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Acknowledgments

We are grateful to Yellowstone National Park supervisors John Varley, John Lounsbury, and other personnel (especially at the Aquatic Resources Center at Lake) including but not limited to Dan Mahony, Jim Ruzycki, Rick Fey, and Harlan Kredit. The group is particularly thankful for access to NPS dormitory facilities, which housed us efficiently. This work was supported by NSF Environmental Geochemistry & Biogeochemistry Program grant 9708501, NSF Life in Extreme Environments grant 0085515, NSF Research Experience for Undergraduates Program grants OCE9423908 and OCE9732316, and National Undersea Research Program grant UCAP 96-07. We also thank W.C. "Pat" Shanks and Lisa Morgan of the USGS for their unflagging interest and enthusiasm sharing their results from the bathymetric surveys of 1999 and beyond. Contribution number 426 of the University of Wisconsin–Milwaukee Center for Great Lakes Studies. The authors also thank All Saints Health Care and St. Luke's Hospital of Racine, Wisconsin, for donating the CAT scan time to analyze the spire.

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RICHARD BEAUCHAMP

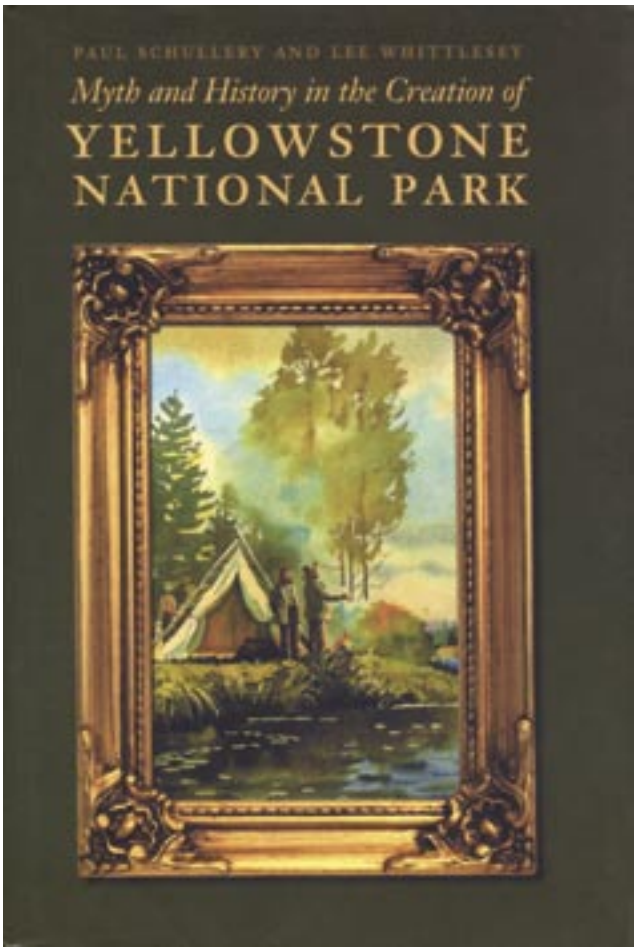
Typical Yellowstone Lake vent team: *Top:* Dave Lovalvo (ROV engineer), C.C. "Tony" Remsen (UWM PI), Mike Lawlor (MU undergrad.), Carl Schroeder (MU graduate student). *Middle:* Carmen Aguilar (UWM PI), Russell Cuhel (UWM PI/PD), James Maki (MU PI), Valdean Klump (UWM helper). *Bottom:* Patrick Anderson (UWM Tech), J. Val Klump (UWM PI).

Since the mid-1980s, a team of scientists and students from the University of Wisconsin–Milwaukee and Marquette University have worked with ROV engineer Dave Lovalvo (Eastern Oceanics, CT) to explore underwater geysers and fumaroles in Yellowstone Lake. In collaboration with YNP personnel from the Yellowstone Center for Resources and the Aquatic Resources group at Lake Station, annual efforts and sampling skills improved from initial surveying supported by NOAA's National Undersea Research Program to large scientist–student teams through major funding from the National Science Foundation in the late 1990s. Raising the Bridge Bay spire was part of an interdisciplinary program on geochemistry of YNP hydrothermal systems headed by UWM.

Book Review

Myth and History in the Creation of Yellowstone National Park by Paul Schullery and Lee Whittlesey

Kim Allen Scott



(Lincoln, NE: University of Nebraska Press, 2003. xv plus 125 pages, acknowledgments, introduction, illustrations, notes, bibliography, index. $22.00 cloth.)

Henry David Thoreau once likened the correction of commonly believed falsehoods to cleaning hardened mortar from used bricks, claiming "it would take many blows of a trowel to clean an old wiseacre of them."[1] The sage of Concord was correct in his assessment of the persistence necessary for such work, but he left unsaid the possibly high cost of such cleaning to the wielder of the trowel. Questionable stories from the past clinging to the foundation bricks of modern institutions can adhere with a tenacity sustained by society's deepest held values, and a person who attempts to closely examine those stories proceeds at their own risk. In extreme cases such a person can be vilified as a heretical iconoclast, as Paul Schullery and Lee Whittlesey have so painstakingly described in this fine study, *Myth and History in the Creation of Yellowstone National Park.* In their narrative the authors wield the trowel of correction accurately and fearlessly, refusing to hide the blemishes that might cause many writers to shrink from the task.

On the night of September 19, 1870, the members of the Washburn-Langford-Doane expedition through the Yellowstone country camped at the junction of the Firehole and Gibbon Rivers. They had just completed a journey through a wilderness that differed radically from anything they had ever seen and they gathered around the fire for what would be their final evening together. In a book he published 35 years later, Nathaniel P. Langford claimed that a resolution was reached by the men around that riverside campfire to forsake personal claims on any of the land they had explored and to individually work toward setting Yellowstone aside as a national park. The tale of heroic self-sacrifice reached spontaneously by a colorful gathering of explorers became so embedded in the history of the park that Langford's story was repeated and embellished in print, spoken word, and even theatrical reenactment well into the 1960s. Yellowstone's keepers actively encouraged acceptance of the campfire story, going as far as erecting a monument on the site and naming a nearby mountain to commemorate the event.

But a problem arose once historian Aubrey Haines carefully analyzed the evidence purporting to document the campfire story: he found it simply did not exist. Haines had worked for the National Park Service since 1938, and while serving as Yellowstone Park historian in the early 1960s, he engaged in writing a definitive history that gave him just cause to question Langford's story. Langford's original diary, from which he allegedly published his book, could not be found within the archival collection of his personal papers, and Haines noted that none of the other diarists present at that 1870 campfire even mentioned such a discussion

taking place. Haines also discovered that Langford's claim of having actively promoted the national park idea during subsequent speaking engagements in the eastern states simply could not be corroborated.

When Haines began to challenge the long established celebration of Yellowstone's birth, officials in the National Park Service reacted with surprising vehemence. Haines suddenly found himself transferred from Yellowstone to a post at the Big Hole National Battlefield in 1964, and while serving out his virtual exile, his old position as park historian was abolished. In 1966, he returned to Yellowstone to assume a vacant job slot as a "geologist" and continue work on his history of the park, but the reaction against Haines's revisionist view of the campfire story would have repercussions far beyond his eventual retirement in 1969. Publication of his two-volume work, *The Yellowstone Story*, was delayed until 1974 and even then Haines had to agree to soften his criticism of Langford's campfire tale. "It is our opinion that *The Yellowstone Story* is the single most important book ever published about Yellowstone National Park," claim Schullery and Whittlesey. "That the park's friends were almost denied access to it just because of an in-house quarrel over the interpretations in a few of its pages still amazes and appalls us." (pp. 67–68).

Myth and History in the Creation of Yellowstone National Park describes the high price paid by Aubrey Haines for his historical integrity and analyzes piecemeal the evidence to explain why the Yellowstone historian came to the conclusions he so fearlessly advanced. But beyond that story, this book suggests the underlying reasons how such a vendetta against the accurate interpretation of Yellowstone's origins occurred in the first place. Accurately defining the word "myth," Schullery and Whittlesey demonstrate how the deeply felt need of societies for epic representations of past events fits so perfectly in the Yellowstone creation story. Myths tell us who we are as humans and how we factor in the natural world. By giving hope to those inclined to believe in the better angels of our nature, myths celebrate heroes who bestow on mankind the benefits derived from their extraordinary adventures. If one considers the modern conservation movement as a sort of secular religion, the belief in altruistic explorers who renounced personal gain for the sake of future generations has tremendous mythical appeal and a resilience that defies historical criticism. As former Yellowstone superintendent Lemuel Garrison is quoted on the campfire story, "If it didn't happen we would have been well advised to invent it. It is a perfect image." (p. 35).

Myth and History in the Creation of Yellowstone National Park is a remarkable book on three levels. First, it is a carefully researched external criticism of the records (or lack thereof) on which the campfire story is based, and in so doing it is an excellent example of historical scholarship at its best. Second, the book unabashedly examines the consequences endured by Aubrey Haines for his role in practicing that same sort of historical scholarship. This is an extremely delicate task for the authors, who have both been in the employ of the National Park Service for many years, and have placed themselves in the unenviable position of having to describe some of the more unsavory aspects of its administration. The fact that the book succeeds in this delicate task is a testament to the skill with which it is written. Finally, the book examines why those who love the park so dearly needed the myth of its creation in the first place. It is not too far a stretch in pointing out to readers that the myth of Yellowstone's creation continues to live alongside a more factual interpretation because it serves a purpose as a "heroic metaphor" for those who need it.

But in consideration of Aubrey Haines's experience, *Myth and Creation* finds its most suitable heroic subject. The thoroughness of Haines's scholarship was matched by his grace in reacting to the consequences of his work. Toward the end of his long and productive life, Haines looked back with exceptional charity on his Yellowstone ordeal and declared, "It came out all right!" In this regard, perhaps Haines is a better example of Thoreau's metaphorical trowel rather than the man who uses it to clean the hardened mortar of falsehood. After the Concord philosopher finished preparing the brick for his Walden cabin, he paused to examine the tool and said, "I was struck by the peculiar toughness of the steel which bore so many violent blows without being worn out."[2]

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COURTESY OF AUTHOR

Kim Allen Scott is the Special Collections Librarian at Montana State University, Bozeman, and author of numerous articles on the trans-Mississippi Civil War and Montana frontier. His biography of Gustavus Cheyney Doane, the leader of the military escort that accompanied Langford through Yellowstone in 1870, will be published by the University of Oklahoma Press. Scott lives in Bozeman with his wife, Jayne, and sons Benjamin and Jacob.

Endnotes

[1] Henry David Thoreau, *Walden or Life In The Woods*, 3rd ed. (New York: New American Library, 1961), 162.

[2] Ibid.

JENNIFER WHIPPLE

NATURE NOTES

Musings from the Berry Patch

Sue Consolo Murphy

I'VE BEEN BITTEN by the berry bug. Each year, it's more serious, this drive to get into the woods, to look at patches found last year or the year before that, to check their progress each summer month and place mental bets with myself on how they'll do this year, when they'll ripen, and how much fruit they'll actually bear.

First, often as early as late June, come the *Fragaria* spp., the wild strawberries, whose tiny white flowers and reddish vines cling to the ground, occasionally leading to even tinier morsels of red. Next are the raspberries, *Rubus idaeus,* whose prickly bushes I accuse of deliberately seeking the steepest, driest slopes and rocky crevices, no doubt to discourage predatory pickers like me, the bears, and other things from plucking their soft seedless fruit. And the large-leaved red thimbleberries, *Rubus parviflorus,* which are much easier to grab but often fall apart before one can even taste their tarter flavor. Most likely to produce a crop in any given year, it appears, are the humble *Vaccinium scoparium*, the grouse whortleberry, whose leaves and red-purple berries carpet the forest floor. Abundant and sweet, these fruits tempt mostly the desperate or lunatic berry-picker, or my small children, who do not dwarf the wee berries so much as I. A lunker is the size of a pinhead—the fancy pearl ones that graced my grandmother's sewing box—yet this species shows, not insignificantly, in the lists of plants eaten by the massive grizzly bears that roam the greater Yellowstone landscape. It conjures up a ludicrous image in my mind of a 500-pound bear delicately munching a berry-and-leaf salad.

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Massive grizzly bears love the wee grouse whortleberries.

As we turn the corner from summer heat toward the chill air of fall, I can find *Sambucus* spp., the tart purplish-black elderberries of my Midwestern childhood that some neighbor took en masse from their umbrella-like stems and added enough sugar to make wine, or pie. But my favorite are the huckleberries, the blue low-bush *Vaccinium caespitosum* that gives little notice of its potential, then seems one day—in a rare August—to burst into abundant production in the open slopes at the base of granite peaks. And the taller huckleberry, *V. membranaceum*, that basks in the shade of the firs and spruces and hugs boulders and hides under the willows that line the streambanks. Biologists I've asked couldn't say for sure, and the berry books express confusion about just what makes for good huckleberry habitat—fire is good, and/or clear cuts, or some shade and just the right mix of sun and moisture, of which greater Yellowstone gets less than the maritime-influenced areas from western Montana to the Cascades, where berries grow big and more predictably each year. When I want serious berries to store for winter, I head for that western country, and bring home full containers for the freezer.

Grand Teton and surrounding Jackson Hole have areas with abundant hucks, especially in a wet summer like that of 2004. Yellowstone is not great berry habitat, they tell me, the vegetation specialists and the bear biologists who've tracked radio-collared bruins to feed sites and collected scats. They've produced charts and graphs and percentages of food by season and digestibility, by protein content and high caloric value. During their study of grizzly bears in the 1960s, the brothers Craighead figured that berries were the fifth most important group of foods and, in later comparing their work with subsequent research in the park, that they declined in importance to grizzlies of the 1970s and 80s. I wonder at this change, whether it might be due to warmer, drier weather in the many drought years the ecosystem has recently experienced, or to other changes—recovering trout populations, larger numbers of elk and bison, better study methods and larger sample sizes. Then again, I've yet to see a bear or its scat in my berry patches, and I wonder at that, too. Have I scared them off, or stolen their potential winter stores? Do they mind that I'm there competing with them? More likely, as Paul Schullery once wrote, the fascination is one-way, the bears not caring one whit about me and my small wanderings of feet and mind.

In my own personal corner of the ecosystem, on private and forest land outside Yellowstone's northeast corner, I first encountered huckleberries in 1995—it's imprinted on my brain as the time just after my first child was born and my wanderings were limited

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Prickly red raspberry bushes grow in steep, dry, rocky places.

to the short distance I could go from my family's cabin in between feedings for a hungry weeks-old babe. I recall the whortleberry bushes having been there all along, blanketing the ground under the old spruces and firs. But the others—how could I have missed those berries for the previous decade? Had they been there all along, so close at hand? Or, was this some burst of berry response to the 1988 fires that removed so much overstory and even a few cabins in our neighborhood? Each year, I find more bushes, not far from those I knew before, amazing and embarrassing me that I didn't see them sooner. I am honing my search image, coming to recognize what looks like good habitat without even yet seeing the plants and, when I find them, screaming silently to myself, "Ah hah! I knew it; there's a patch! How will *it* do this year, how will it rate compared to this other patch, and that one?"

Though I proudly count the years by my "haul"—one year a meager two cups of hucks, another a very respectable two or three gallons—and I enjoy making jam or huckleberry pie, it's not the "take" that I really value. In my generalist way I've skated across the landscape, looking somewhat surficially at everything, whereas in my professional life I'm surrounded by specialists who delve into detail and thrive on pursuing ever deeper into their subject matter. I've often felt like a fish out of water among them, these experts in plants and carnivores and archeology and geothermal things. But in familiar berry patches I look closely and repeatedly, marveling at the subtle differences from year to year. *That* year, the patch across the creek showed no flowers, not a tiny berry. The *next* year, it was a banner crop; we sat on rock after rock and reached around us in a 360° circle and picked until our fingertips were purple and the zip lock bags full. Most years, the patches under the unburned forest produce the most, I suppose because they hold the moisture in the dry summers; I can feel the cold air draining down the creek, in the rare shade of an unburned grove of firs. But some years, like this one of the wet June, those overlooked *V. caespitosum* spit out quart after quart from their three-inch-high plants, clinging to the open, burned hillsides.

It's a good passtime, I think. As my children grow, they keep watch with me, the older one eager to out-pick the rest of us, the younger content to eat all she finds, but both easily entertained. We mark the months in anticipation of each year's berry crop, and it gives us an excuse to go out and search, week by week, on old trails and new. I relish the attention on small details, the intense focus I've seldom desired to place on one species or work project, and which does not fit my mid-level managerial role. Searching for them, I'm reminded that perspective is so important—viewed from one angle, a patch yields little, yet by moving and looking from another direction or height I can see plums that I'd previously missed. I find contemplative hours that are otherwise hard to come by, and think of the passage of time, the subtle differences in sites and situations one year to the next. I make my own working hypotheses, and lean toward the belief that what I see resulted from those memorable fires, so vivid in my own mind that each year, I forcibly count and think, how could it be *16* years now…it was only *yesterday* that the Storm Creek fire raged across the landscape and torched our decadent old trees, then merged with Clover Mist to drive the firefighters out of their camp in the dead of night…

My berry patches are my own research project, one on which I need never publish. A hobby growing toward, I believe, a not unhealthy obsession, though I may yet hear from "Berry-pickers Anonymous." I roam my wild gardens that compensate for the fruit I cannot plant in the yard of my government quarters. They remind me, not unkindly, of my transition from young, idealistic ranger to middle-aged pragmatist. Of the career path I chose and the niches I happened upon, like a new huckleberry find. Of the lessons of nature, the unpredictability of life events, and the ever-present beauty in small things, often dwarfed in the vast and spectacular landscape of greater Yellowstone.

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COURTESY OF AUTHOR

Sue Consolo Murphy is Chief of Science and Resource Management in Grand Teton National Park. She is also a former branch chief of cultural resources in Yellowstone, where she spent time helping to plan the Heritage and Research Center, as well as a former editor of *Yellowstone Science*. Before that, she spent eight years as a resource management specialist with the natural resources staff in Yellowstone.

From the Archives

William Henry Jackson's Liberty Cap photograph.

Thomas Moran's Liberty Cap watercolor.

*"—my friend, Thos. Moran, an artist of Philadelphia of rare genius, has completed arrangements for spending a month or two in the Yellowstone country, taking sketches for painting. He is very desirous of joining your party…and accompanying you to the head of the Yellowstone. I have encouraged him to believe that you [would] be glad to have him join your party, & that you would in all probability extend to him every possible facility. Please understand that we do not wish to burden you with more people than you can attend to, but I think that Mr. Moran will be a very desirable addition to your expedition, and that he will be almost no trouble at all, and it will be a great accommodation to both our house [Jay Cooke & Co.] & the [rail]road, if you will assist him in his efforts. He, of course, expects to pay his own expenses, and simply wishes to take advantage of your cavalry escort for protection. You may also have six square feet in some tent, which he can occupy nights…"**

—letter from Jay Cooke's office manager to Dr. Ferdinand V. Hayden, head of the first government-sponsored exploration of the Yellowstone region in 1871

With that, artist Thomas Moran accompanied the 1871 Hayden expedition in the interests of the Northern Pacific Railroad Company and Scribner & Co. Publishers N.Y. During his two-month trip, he sketched dozens of watercolor studies that later served as the basis for paintings. Hayden, the Northern Pacific Railroad, and others soon began promoting the idea that Yellowstone should be protected and preserved as a national park. Moran's watercolors, along with William Henry Jackson's photographs from the 1871 expedition, were taken to Capitol Hill and shown throughout the halls of Congress and before the Congressional Committee. Moran's sketches were the first color images of Yellowstone that had ever been seen in the East. The Jackson and Moran images were later reported to have played a decisive role in the debate that led to the 1872 establishment of Yellowstone as the first national park. Just three months after its establishment, Congress appropriated $10,000 for the purchase of Moran's 7' × 12' "Grand Canyon of the Yellowstone" to be displayed in the Senate lobby. It now resides in the Department of the Interior Museum in Washington, D.C. Yellowstone's collections include 22 works by Moran, and more than 500 works by Jackson, which now reside in the Yellowstone Heritage and Research Center.

*from *YNP: Its Exploration and Establishment* by Aubrey L. Haines, p. 101. U.S. Department of the Interior, NPS, U.S. GPO, Washington D.C., 1974. From A.B. Nettleton to Hayden, June 7, 1871. NA Microfilm 623, reel 2, frame 0120.

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In this issue

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Dona McDermott, archivist at Valley Forge National Historical Park, rehousing women's elk-skin gloves that are part of Yellowstone's museum collection, now in the Heritage and Research Center.

This winter, *Yellowstone Science* looks back on the first 10 years of the park's wolf restoration program.

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PO Box 168
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