



**YELLOWSTONE
CENTER FOR RESOURCES
2009 ANNUAL REPORT**





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Yellowstone Center for Resources
National Park Service
Yellowstone National Park, Wyoming

YCR-2011-02



Suggested citation: Yellowstone Center for Resources. 2011. Yellowstone Center for Resources Annual Report, 2009. National Park Service, Mammoth Hot Springs, Wyoming, YCR-2011-02.

Photographs not otherwise marked are courtesy of the National Park Service.

Cover photos: A male flame skimmer (*Libellula saturata*) identified during the bioblitz. Flame skimmers are usually found near thermally influenced waters in the park (photo used with permission by Payam Ostovar). A community participant collects macroinvertebrate samples during the 2009 bioblitz (NPS photo by Ann Rodman). Grizzly bear along Obsidian Creek (NPS photo by Jim Peaco, April 24, 2009).

Previous page: Bison along the north shore of Yellowstone Lake (photo by JoAnn Waller).

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Introduction

Yellowstone's unique geological and biological resources inspired its creation as the world's first national park in 1872. The National Park Service (NPS) is legally responsible for preserving, unimpaired, the park's natural and cultural resources and values for the enjoyment, education, and inspiration of this and future generations. The Yellowstone Center for Resources (YCR) works to fulfill these responsibilities for the resources we are mandated to manage and protect.

Although dozens of researchers have studied Yellowstone's charismatic megafauna and life in its unusual geothermal features, little is known about most of the thousands of species in the park. As a start in filling that gap, more than 125 volunteer scientists participated in the park's first "bioblitz" during a 24-hour period starting on August 28, 2009. While the number continues to grow as additional specimens are identified in the lab, their fieldwork has resulted in the identification of more than 1,100 species, including 80 bird species and the discovery of a previously unreported graminoid, little ricegrass (*Piptotherum micranthum*).

The University of Montana Archeological Field School inventoried several areas along the north shore of Yellowstone Lake. Archeological sites and hearth features in this area have been eroding as a result of water level changes, and portions of terraces above the lakeshore are expected to be disturbed during future utility work. In September, YCR staff arranged a two-day workshop to help park staff identify ways for Yellowstone to develop an effective tribal relations program and make the park a place that is welcoming to American Indian peoples and cultures. In addition to cataloging almost 68,000 items from the museum collections backlog, Heritage and Research Center staff processed 33 new accessions in 2009, including natural history specimens collected during the park's first bioblitz, several early park souvenirs, and 42 bison mandibles.

YCR staff began planning the 10th Biennial Scientific Conference on the Greater Yellowstone Ecosystem to be held October 11–13, 2010, at the Mammoth Hot Springs Hotel. The conference theme, "Questioning Greater Yellowstone's Future: Climate, Land Use, and Invasive Species" was developed by the program committee after consultation with the park superintendent.

In 2009, more than 100,000 nonnative lake trout were removed from Yellowstone Lake. The northern portion of the lake experienced a swarm of more than 800 earthquakes with magnitudes up to 4.1, the second such swarm in as many years. Many of the 218 known, established nonnative plant species continued expanding their ranges, and 1,825 hazardous trees were removed. The estimated population of grizzly bears in the GYE was 582, one year after the U.S. Fish and Wildlife Service removed this population from threatened status under the Endangered Species Act. A large interagency operation moved bison back within the park and no bison had to be removed to meet brucellosis risk management goals in 2009. One bison was harvested outside the park in Montana by a licensed hunter. The population size was estimated at 3,300 during the summer of 2009. The year-end wolf population declined to 96 wolves with 11 of the 14 packs producing pups.

The YCR's partnerships and agreements with other federal and state agencies, academia, and public organizations continued to be critical to our successes in stewardship. The YCR also continued to benefit from the hard work of many volunteers and cooperators. Research Permit Office staff authorized almost 200 research permits to investigators from across the U.S. and foreign countries.

For more information, readers may contact us at (307) 344-2203, visit the park's website at www.nps.gov/yell, or visit the Greater Yellowstone Science Learning Center website at www.greateryellowstonescience.org.



Linda Mazzu
Acting Chief, Yellowstone Center for Resources

PART I

Cultural Resources

The Branch of Cultural Resources helps preserve and increase knowledge of Yellowstone's resources in these areas:

- Archeology
- Ethnography
- Historic Structures
- Yellowstone Heritage and Research Center



Molly Conley and Erika Hamor help to process and conserve natural history specimens.

Archeology

The University of Montana Archeological Field School

Assisted by YCR staff through an agreement with the Rocky Mountain Cooperative Ecosystem Study Unit, the field school inventoried several areas in the park in 2009. Along the north shore of Yellowstone Lake, where archeological sites and hearth features have been eroding as a result of water level changes and portions of terraces above the lake-shore are expected to be disturbed during future utility work, the participants identified two new precontact archeological sites and documented 13 previously known but inadequately recorded precontact sites. In locations that have been proposed for new or altered parking areas in the park's road improvement program, they documented two previously unknown sites and four known sites.



JOANN WALTER

University of Montana Archeological Field School participants identified two new precontact archeological sites and documented 13 previously known but inadequately recorded precontact sites along the north shore of Yellowstone Lake.

Developed Area Inventories

As a result of agreements with the Rocky Mountains Cooperative Ecosystem Studies Unit and the University of Wyoming Anthropology Department, YCR staff assisted the Office of the Wyoming State Archeologist in inventorying sites in approximately 390 acres in and around Mammoth

Hot Springs, the North Entrance, and the concession area near Gardiner, Montana, and completing baseline documentation of cultural components in the Old Faithful developed area.

Golden Gate to Norris Junction Road Reconstruction

With preparations underway to widen a section of the Grand Loop Road that bisects five precontact archeological sites associated with obsidian procurement near Obsidian Cliff, park staff have worked with the Office of the Wyoming State Archeologist and the Wyoming State Historic Preservation Office to develop data recovery plans for the sites. Excavation work has been completed at three sites, from which more than 130,000 artifacts and specimens were collected. Due to the technical excavation procedures required for data recovery, no volunteer assistance was used, but University of Wyoming students were involved in the processing and analysis of the flake stone debitage. Artifacts and geologic specimens have been transported to Laramie for laboratory processing; botanical, soil, and carbon samples have been sent out for specialized analysis. Eventually all artifacts and specimens will be accessioned into Yellowstone's museum collection.

Nez Perce Trail

The 2009 field season was the third in a four-year investigation of the approximately 85 miles of the Nez Perce National Historic Trail, the route taken by the Nez Perce when they fled through the park in 1877 pursued by the U.S. army. Park staff were assisted by three volunteers in surveying and videotaping sites with the most potential, and used metal detectors to locate buried objects that could indicate a former campsite.

Fawn Pass Snowshoe Cabin

Prior to mechanical fuels reduction, an archeological inventory and National Register testing in the 15-acre area around the Fawn Pass snowshoe cabin documented two known precontact archeological sites and one new precontact archeological site.

Ethnography

YCR staff worked with the interpretive staff to develop a new wayside exhibit on the Nez Perce

National Historic Trail that will be installed in the park in 2010. In August, Shoshone-Bannock representatives met with YCR staff to discuss the park's planning process. In September, YCR staff arranged a two-day workshop whose attendees included Superintendent Lewis, Deputy Superintendent Lehnertz, and three American Indians with experience in intertribal and intergovernmental relations: the Superintendent of Mount Rushmore National Memorial, Gerard Baker; William Yellowtail, a Crow who is the former regional director of the Environmental Protection Agency and holder of the Montana State University Katz Endowed Chair in Native American Studies; and Brady Grant, Tribal Historic Preservation Officer of the Turtle Mountain Band of Chippewa. They helped park staff identify ways for Yellowstone to develop an effective tribal relations program and make the park a place that is welcoming to American Indian peoples and cultures.

Historic Structures

Assistance provided by park volunteers, the Montana and Wyoming Historic Preservation Offices, and through agreements with the Montana Preservation Alliance, the University of Montana Anthropology Heritage Resource Program, and the Rocky Mountains Cooperative Ecosystem Studies Unit enabled park staff to address these issues in regard to the park's historic structures at many sites during 2009:

- **Hellroaring and Blacktail suspension bridges:** documentation for determination of eligibility for the National Register of Historic Places prior to repairs.
- **Stevenson Island cabin:** locating and recording of the remains of a cabin used by the caretaker of wildlife kept on Dot Island for display purposes from 1886 to 1907.
- **Backcountry cabins:** determination of eligibility for listing on the National Register and selection of rusted Cor-Ten corrugated steel roofing as appropriate for all backcountry cabins except those contributing to the Fort Yellowstone National Historic Landmark.
- **Mission 66 historic context:** contracting of the historic resource study needed to determine edibility of buildings constructed during the Mission

66 program for the National Register and prepare the Multiple Property Submission.

- **Lamar Buffalo Ranch:** proposal of changes to improve the energy efficiency of three historic buildings at the ranch, including replacement of original doors and modern replica windows with ones having double pane glass and the addition of insulation to the interior walls, floors, and ceilings.
- **Haynes Photo Shop at Old Faithful:** consideration of the findings of a report by an engineering consultant which determined that the building could be properly stabilized if placed on a new foundation. Park staff will conduct further deliberations on the issue in consultation with the Wyoming State Historic Preservation Office in 2010.

Yellowstone Heritage and Research Center

Assisting Researchers

The Yellowstone Heritage and Research Center in Gardiner, Montana, houses the park's archives and library collection and most of its museum collections, together including several million items that document the cultural and natural history of the park. During 2009, HRC staff responded to 508 inquiries regarding the archives, nearly half from NPS employees, including on-site visits, telephone, email, and written research requests. They also helped more than 100 researchers with historical photographs and other inquiries about the museum collection; assisted about 1,000 library patrons; and responded to hundreds of questions via

phone and email. For the fourth summer, the librarians provided a bookmobile service to make the library's collections and resources more accessible to NPS and Yellowstone Association employees in the park's interior.

Acquisitions

In addition to cataloging almost 68,000 items from the museum collections backlog, HRC staff processed 33 new accessions in 2009, including natural history specimens collected during the park's first bioblitz, several early park souvenirs, and 42 bison mandibles. Collections added to the archives in 2009 included the field notebooks of a former park geologist, Wayne Hamilton; the diary of an 1896 trip to the park; menus from park lodging facilities; oral histories of local residents collected by Gardiner High School students; and a set of concessions business records from the Haynes family. The library added 183 hardcover dissertations relating to various Yellowstone topics.

Collection Conservation

Funding from the Yellowstone Association was used to purchase acid-free housing materials to improve the storage of many archival and library



Maeve Pinto (second from left) conducts a tour of the Rare Books Room for park visitors.



The 2009 staff of the Heritage and Research Center.

documents, including the binding of more than 100 theses and periodicals in the research library. With matching funds from the Yellowstone Park Foundation for an NPS Centennial Challenge project, the cleaning, stabilization, and rehousing of 70 items in the museum collection was completed in 2009. Yellowstone Park Foundation funding also paid for the transfer of 20 reel-to-reel films to DVD while preserving the originals. Funding for NPS Cultural Cyclic projects was used to rehouse several thousand historical photographs, have safety negatives made of approximately 1,500 nitrate negatives, and hire four graduate students as seasonal employees to inventory the park's collection of archival map and oversized documents. Barbara Cumberland, NPS conservator, returned in 2009 to complete the cleaning of specimens at the Fishing

Bridge Museum. Lynn Mitchell, the regional archivist, spent several weeks helping staff improve the management and organization of the archives and plan a park-wide survey of the permanent records held by various offices in the park.

Historical Research

The park historian devoted most of his time during 2009 to researching and writing a history of the Mammoth Hot Springs developed area to assist with long-term planning for the area. He also completed a manuscript on the history of the Mount Washburn lookout and continued to work on a long-term project, a book on "The History of Animals of the Greater Yellowstone Region," and to assist park staff and outside researchers in finding answers to their questions about Yellowstone history.

PART II

Natural Resources

The Branch of Natural Resources helps preserve and increase knowledge of Yellowstone's resources in these areas:

- Bioblitz
- Air Quality
- Geology
- Vegetation
- Resource Management Operations
- Aquatic Resources
- Bears
- Birds
- Ungulates
- Wolves
- Yellowstone Wildlife Health Program

Bioblitz

Although dozens of researchers have studied Yellowstone's charismatic megafauna and the life in its unusual geothermal features, little is known about most of the thousands of species in the park.



A community participant collects macroinvertebrate samples during the 2009 bioblitz.



PHOTO USED WITH PERMISSION BY PAVAN OSTOVAR

A male flame skimmer (Libellula saturata) identified during the bioblitz. Flame skimmers are usually found near thermally influenced waters in the park.

To help fill that gap, more than 125 volunteer scientists participated in the park's first "bioblitz" during a 24-hour period starting on August 28, 2009. The following day, participants shared their findings with visitors at the Albright Visitor Center in Mammoth Hot Springs who ages took part in hands-on activities, including a bird-call memory game, viewing live birds of prey, examining skulls and animal tracks, and viewing specimens under microscopes. The fieldwork has resulted in the identification of more than 1,100 species, including 80 bird species and the discovery of a previously unreported graminoid, little ricegrass (*Piptotherum micranthum*).

The bioblitz was funded by a grant from Canon U.S.A., Inc., to the Yellowstone Park Foundation that matched NPS Centennial Challenge funds for the Greater Yellowstone Science Learning Center. The planning team for the event also included staff and volunteers from the Yellowstone Association, the Big Sky Institute at Montana State University, and Rocky Mountain College.

Air Quality

No National Ambient Air Quality Standards were exceeded in Yellowstone in 2009 for the three measured criteria pollutants: ozone, particulate matter, and carbon monoxide. The draft Air Quality in National Parks 2009 Annual Performance and Progress Report indicated that air quality neither

deteriorated nor improved in the park from 1999 through 2008. Nitrogen deposition, however, continues to be of significant concern because it is occurring at levels known to be harmful to sensitive resources, including alpine areas, wetlands, arid areas, and grasslands. The nitrogen deposition results from emissions from vehicles, power plants, industry, agriculture, and fires.

Air quality is also monitored at the West Entrance and at Old Faithful during the winter because of concern about the effects of oversnow vehicles. The combination of fewer snowmobiles entering the park and reduced emissions by snowmobiles because of the “Best Available Technology” requirement has greatly reduced carbon monoxide and particulate matter concentrations since 2003. However, although air quality in the park meets Environmental Protection Agency standards for protection of human health, carbon monoxide levels are sometimes above natural regional background levels in areas near vehicle routes, especially during the winter.

Geology

Compared to a range of 872 to 3,172 earthquakes per year from 1995 to 2008, about 1,582 earthquakes were detected in the park in 2009. An earthquake swarm occurred at the north end of Yellowstone Lake from December 26, 2008, to January 8, 2009, during which there were 811 earthquakes in the range of M0.5 and M4.1. Park staff at Lake felt many of the 21 quakes that were larger than M3.0; the largest was M4.1.

No basin-wide changes in geothermal activity were noted in 2009. The Old Faithful eruption interval remained at 90 to 91 minutes and Steamboat Geyser did not have a

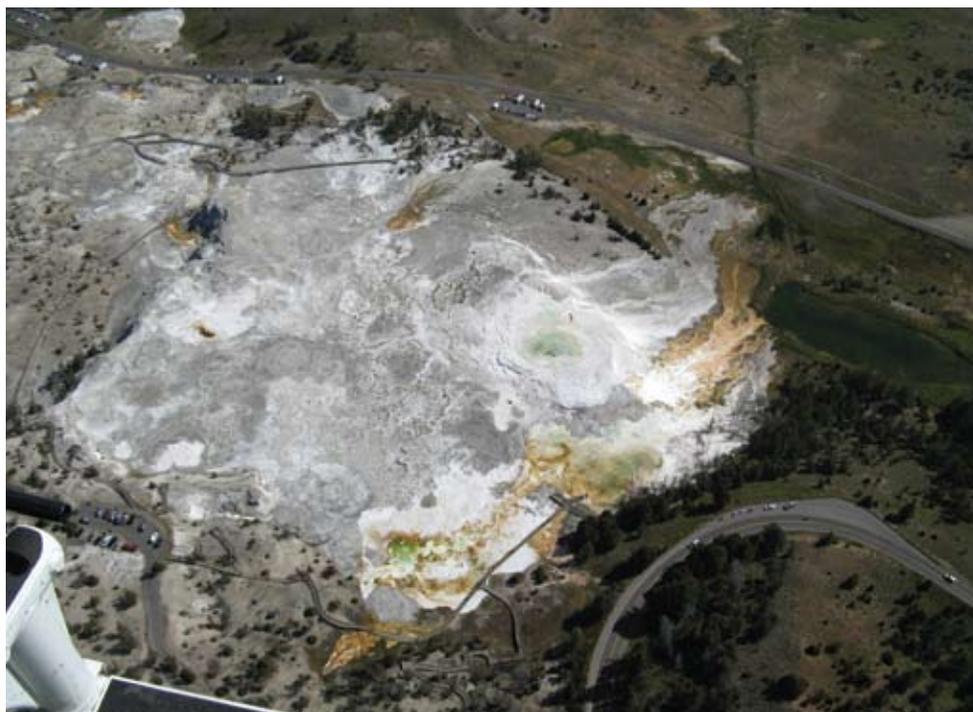
major eruption. Echinus Geyser at Norris went into a period of quiescence, with only one eruption during the year, on December 7, 2009. Hydrothermal explosions continued at Wall Pool in Biscuit Basin, where at least nine were reported.

Work continued on the park’s geothermal monitoring program with progress made in documenting the status and trends of the geothermal system by measuring the total amount of thermal water and the total heat output for selected geyser basins. Aircraft and helicopter thermal infrared images are being used to document natural and anthropogenic changes in the hydrothermal areas.

Vegetation

Inventory and Monitoring

Park staff have met the servicewide inventory and monitoring goal of documenting at least 90% of the park’s 1,346 vascular plant species and incorporating the information into the NPSpecies biodiversity database, which now includes the approximately 10,130 specimens in the park’s herbarium. During the 2009 field season, at least 76 vascular plant specimens were collected for addition to the herbarium.



Helicopter oblique photographs of Canary, Main, and Trail springs in August 2009 showing new hydrothermal activity along the southern edge of the Main Terrace.

To prevent impacts on rare plant populations, park staff conduct surveys prior to construction projects, trail re-routes, and other activities that will disturb the soil. In addition to complying with statutory requirements, these surveys collect valuable data: 162 sites were documented during 2009 for the GIS layer of Wyoming species of special concern and plants that are rare in the park. Summer fieldwork for Federal Highway Administration projects took place primarily in the Old Faithful area, where 600 sites containing rare species have now been documented. Park staff also began rare plant surveys and wetland delineation for the Lake development area.

Gardiner Basin Restoration

As part of the long-term project to restore former agricultural fields along the Yellowstone River corridor inside the park's north boundary, 50 acres were treated with herbicides and seeded with preparatory cover crops with financial support from Recreation Fee Demonstration funds. The sites are fenced to exclude wildlife while native vegetation is re-established.

Woody Vegetation

The controversies surrounding the status of woody vegetation on the northern range (aspen, willow, and cottonwood) as it has been affected by changing elk population levels and wolf reintroduction continued to support diverse research opportunities in 2009, including:

- completion of a study of bird species diversity in willow communities of varying structure and size (Dr. Andrew Hansen of Montana State University);
- ground-based willow mapping of selected stream drainages to complement previous mapping efforts (Dr. Mike Tercek through the Greater Yellowstone Inventory and Monitoring Program and Big Sky Institute, Montana State University);
- the second year of a study on the influence of hydrology and herbivory on cottonwood establishment and persistence (Dr. David Cooper and graduate student Josh Rose, Colorado State University);
- the continued monitoring of elk use and aspen performance in 113 established aspen clones across Yellowstone's northern range (in conjunction

with Dr. Eric Larsen, University of Wisconsin-Stevens Point, and Dr. William Ripple, Oregon State University);

- the initiation of a study of aspen dynamics and performance in the Firehole, Gibbon, and Madison river valleys where changes in elk abundance and distribution have been documented (Dr. Dave Roberts and graduate student Tim Shafer of Montana State University);
- the third year investigating beaver occupancy in streams throughout the Greater Yellowstone area over the past 2000 years (with Dr. Grant Meyer and graduate student Lyman Persico, University of New Mexico).

Insect Infestations

The primary cause of tree mortality in the park is native bark beetles. Although both Douglas-fir beetle and Engelmann spruce beetle activity have declined to endemic levels since 2000, other forest insects of economic and ecologic importance remain active. Widespread mountain pine beetle activity continued in the high-elevation whitebark pine stands, particularly in the northwest portion of the park, and it appears to be increasing in lower elevation lodgepole pine forests throughout the park. Western balsam bark beetle activity throughout the high-elevation subalpine fir stands was also noted, as was continued defoliation of Douglas-fir and Engelmann spruce by the western spruce budworm along the Yellowstone and Lamar river valleys. An effort to determine what, if any, influence insect infestations may have on landscape-level fire patterns and was completed in 2009 through agreements between the Rocky Mountains and Great Lakes cooperative ecosystem studies units and three university-affiliated researchers (Dr. Dan Tinker, University of Wyoming; Dr. Monica Turner, University of Wisconsin-Madison; and Dr. William Romme, Colorado State University). A final manuscript detailing the work was submitted for publication.

Fire Management

Twenty fires, 17 of which were lightning caused, burned roughly 11,000 acres in the park during the 2009 fire season. The largest fire was the 10,700-acre Arnica Fire. The vegetation management specialist served as a Long-Term Analyst with the Arnica and other managed fires and helped the fire management

team with aerial mapping and monitoring of the fires, made daily and long-term fire behavior projections, and briefed management staff and field crews on observed and expected fire behavior. The Spatial Analysis Center produced maps of the fires to meet the needs of the fire crews, the Public Affairs Office, and the public.

Integrated Pest Management

As the park's Integrated Pest Management Coordinator, the vegetation management specialist provided assistance in response to 39 pest complaints in 2009, submitted 28 pesticide use requests for approval, completed 24 pesticide use logs for specific pesticides used in the park during 2008, and participated in a workshop on bed bug control at Grand Canyon National Park.

Resource Management Operations

The primary role of YCR's resource management staff is to intervene in the day-to-day situations in which the park's cultural or natural resource values are at risk because of human activities. By working with other park staff in the maintenance, interpretation, and protection divisions, they help manage backcountry areas, enhance public safety by removing hazard trees, monitor the geyser basins and remove the thousands of items that are thrown or dropped in the thermal features, and educate visitors in protecting park resources. Their involvement in these functions greatly facilitates YCR engagement in broad resource management issues and helps the YCR carry out its own projects, long-term programs, and field research. Nearly half of the staff time was spent educating the public about and monitoring and controlling the spread of invasive aquatic and plant species.

Nonnative Plants

RMO staff have primary responsibility for control of invasive terrestrial plant species. The effort to prevent, monitor, and control the spread of exotic vegetation has been underway during the summer for more than three decades. No new nonnative species were reported in the park in 2009, but many of the 218 known established nonnative

species continued expanding their ranges. A total of more than 7,108 hours were devoted to exotic vegetation identification and control by 25 members of the park staff, 6 Student Conservation Association interns, 6 full-time summer volunteers, 32 Montana Conservation Corp members (4 crews of 8), a crew from the NPS Northern Rocky Mountains Exotic Plant Management Team, and dozens of other volunteer groups and individuals.

With the focus primarily along park roads and in developed areas, which is where most new plants are found, crews

- surveyed approximately 15,600 acres, of which 4,900 acres contained invasive nonnative plants;
- treated 137 acres, of which 103 acres (76%) were along roads and in developed areas; the remaining 24% were along trails and in the backcountry;
- controlled 42 invasive species at a total of 1,354 sites; some sites received more than one treatment during the summer, resulting in a total of 1,726 treatments using a total of 19.6 gallons of herbicide concentrates.



A total of more than 7,108 hours in 2009 were devoted to exotic vegetation identification and control.

Resource management staff were also involved in other invasive plant prevention activities.

With assistance from a contractor provided by the Greater Yellowstone Coordinating Committee, RMO staff conducted 38 inspections for invasive plants at sand and gravel pits in the Greater Yellowstone area, resulting in the approval of eight pits for use of their material in the park.

RMO staff assisted the Greater Yellowstone Coordinating Committee and seven cooperative weed management areas to map and treat land adjacent to the park, focusing on a new arrival in the area, dyer's woad (*Isatis tinctoria*), monitoring biological control release sites, and support of weed education efforts.

RMO staff inspected hay entering the park on vehicles at entrance stations and inspected and cleaned vehicles used by wildland fire operations.

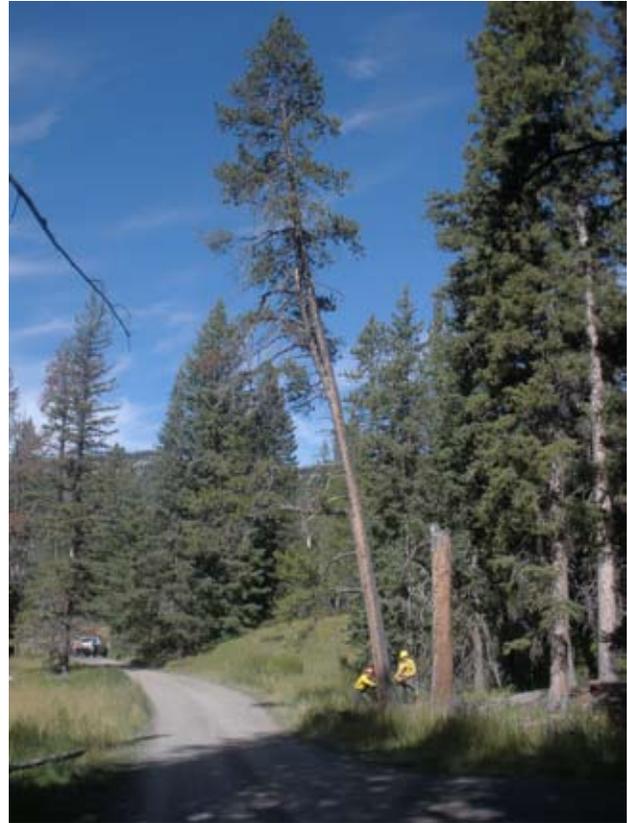
Hazard Trees

To protect people and property, potentially hazardous trees in areas of high visitor and employee use must be identified and removed. Following protocols established by the park's Hazard Tree Management Plan, resource management staff are responsible for assessing and documenting hazard trees in park campgrounds, picnic areas, trailheads, along public and administrative roads, and in other developed areas. With training provided by the vegetation management specialist and assistance from maintenance and fire cache crews, they removed a total of 1,825 trees (1,690 dead and 135 live) in 2009.

Aquatic Resources

The top priorities for the park's Fisheries Program are the preservation of Yellowstone cutthroat trout (YCT, *Oncorhynchus clarki bouvieri*) in Yellowstone Lake and restoration of fluvial populations of native trout, many of which have been lost because of non-native species introductions.

The mainstem of the Snake River, the Lewis River and the Lewis River channel between Lewis and Shoshone lakes were formally designated Wild and Scenic Rivers within the park under the Omnibus Public Lands Management Act of 2009. The values for which a river was designated are defined in the 1968 Wild and Scenic Rivers Act as the river's free-flowing condition, water quality, and "outstandingly



In areas of high use, potentially hazardous trees must be removed in order to protect people and property.

remarkable values" (ORVs). Fisheries and water quality have been identified as two of many ORVs in the designated river sections through the Coordinated River Management Planning process to be completed in 2012. Both the Salmon and Lewis segments are within the historical distribution of YCT and other native fish species, and the need for habitat restoration for the fisheries ORV will be emphasized during the planning process.

Yellowstone Cutthroat Trout Preservation

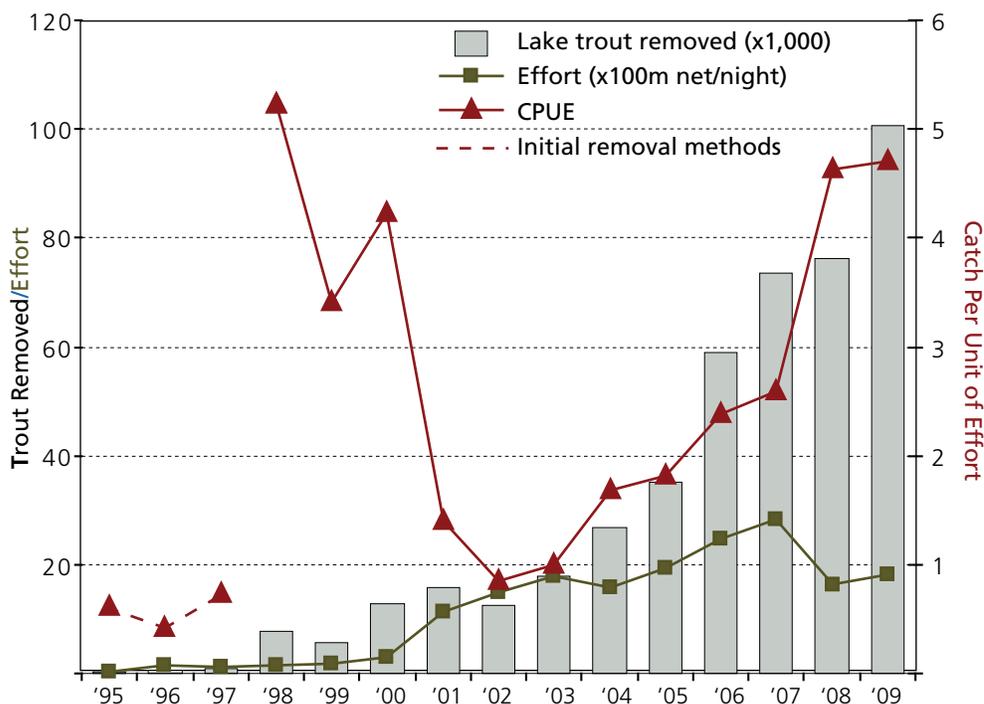
The YCT population in the Yellowstone Lake ecosystem has declined substantially since 1988 as a result of the presence of nonnative lake trout (*Salvelinus namaycush*) that prey on it and compete with it for food, the exotic parasite that causes whirling disease, and low water flows caused by a series of drought years. Lake trout appear insusceptible to the whirling disease that has severely reduced cutthroat trout abundance in Pelican Creek, a tributary to Yellowstone Lake. Although approximately 38% of the YCT in the 2009 catch were greater than 330 mm in total length, what has been missing in recent years are fish in the 200 to 250 mm range fish that will continue into adulthood.

Lake Trout Removal. About 450,000 lake trout have been removed from Yellowstone Lake since the effort began in 1995, including more than 100,000 in 2009. The largest lake trout recorded in the park (24.3 pounds) was caught in 2009. To augment the lake trout removal efforts of Yellowstone staff, the National Park Service contracted with Hickey Brothers Fisheries, LLC, of Baileys Harbor, Wisconsin, to use their research vessel, which can set 18,000 to 27,000 feet of gill net a day in Yellowstone Lake. During their three-week trial period in 2009, they caught more than 14,400 lake trout.

YCT Restoration on the Northern Range. As a result of recent invasions of Slough and Soda Butte creeks by rainbow trout (*Oncorhynchus mykiss*), in 2009 plans were developed to save the YCT in these drainages, including the possible construction of fish barriers in both creeks. As in past years, park staff participated in a multi-agency effort that has significantly reduced the brook trout (*Salvelinus fontinalis*), in Soda Butte Creek.

Native Trout Restoration

Westslope Cutthroat Trout. After receiving piscicide treatments to remove the nonnative fish, High Lake has been stocked annually since 2007 with westslope cutthroat trout (*Oncorhynchus clarki lewisi*) from the two known genetically pure westslope cutthroat trout populations in the park and Upper Missouri River brood stock from a hatchery. Subsequent monitoring indicates that the stocking has been successful. An abundance of fry were visible in the inlet streams and various locations around the lake margin, adult fish were seen in the littoral zone feeding on aquatic invertebrates, and otters and other wildlife that feed on fish have returned. In preparation for westslope cutthroat trout restoration in the East Fork Specimen Creek below its outlet from High Lake, a large amount of concrete packed to the site on mules in 2009 was used to halt the erosion that had begun on the creek bank and improve the integrity of the fish barrier that has been constructed there. The piscicide treatments applied in 2008 and 2009 to remove the nonnative fish and hybridized westslope cutthroat trout from the creek appear to have been successful and stocking of the creek with westslope cutthroat trout are expected to begin in 2010.



Number of lake trout removed by netting and catch per unit of effort (CPUE) on Yellowstone Lake, 1994–2009. Since 2002, the CPUE has increased, indicating that despite the hundreds of thousands of lake trout removed, the population has grown.

Arctic Grayling. Competition from introduced fish species eliminated the fluvial Arctic grayling (*Thymallus arcticus montanus*) that were native to park waters by the 1950s, and the lower reaches of Grayling Creek, where grayling were most abundant, were submerged by the completion of the Hebgen Dam. The uppermost reaches of Grayling Creek, considered a potential site for fluvial grayling restoration, are occupied by brown trout (*Salmo trutta*) and hybridized cutthroats. Interagency efforts were expanded in 2009 to survey most of the stream's tributaries and headwaters and collect high-resolution fish composition, distribution, and genetic data.

Water Quality

Chemical, physical, and biological properties of the park's surface water vary considerably with season, location, elevation, geology, and proximity to thermal activity. Thermal areas affect water temperature, acidity, and dissolved chemicals. Water temperature, dissolved oxygen, pH, specific conductance, turbidity, and total suspended solids are monitored monthly at 11 stream and 7 lake sites in the park. Chemical parameters are collected from 10 stream sites.

In 2009, three of the stream sites did not meet Environmental Policy Act and/or state standards for pH, turbidity, or temperature in at least one monthly sampling. However, these exceedences are likely the result of natural rather than anthropogenic factors. Many stream sites have upstream thermal inputs that affect pH and water temperature.

As a result of elevated metal concentrations from previous mining activity upstream of the park, dissolved and total metals (arsenic, copper, iron, and selenium) in the water and sediment of Soda Butte Creek are measured at the park boundary during its annual high and low flow periods. Although the metal concentrations appear negligible, the water is at risk from upstream contamination during an extreme flood event. Samples taken from the site at Soda Butte Creek exceeded EPA and state standards for dissolved iron during one 2008 visit and two visits in 2009. State and federal agencies are participating in a long-term plan to remove the mine tailings from the streambed.

Dissolved ion concentrations in Yellowstone waters are generally low compared to other surface waters, especially in the spring during high runoff;

higher concentrations are recorded in the fall and winter during low flow conditions. Distinct patterns of relative dissolved ion concentrations are observed in the Yellowstone and Madison river drainages. The most abundant ion in all watersheds is bicarbonate; concentrations of other major ions vary among watersheds. The Lamar River drainage has higher concentrations of calcium ions than the Yellowstone River mainstem, which has higher concentrations of sulfate.

In addition to bicarbonate ions, sodium and chloride are present in approximately equal proportions in the Madison River basin. Phosphorus and nitrogen concentrations are generally very low in most park waters. In 2009, nitrate concentrations in Yellowstone River at the lake outlet were below the analytical detection limit (0.05 µg/L) for all 10 samples; total phosphorus concentrations ranged from not detectable to 0.060 µg/L. Of the park's major rivers, the Madison River tends to have the highest nutrient concentrations. In 2009 total nitrate was not detectable for 10 samples; total phosphorus ranged from 0.131 to 0.242 µg/L.

Aquatic Invasive Species

In addition to the lake trout in Yellowstone Lake, two nonnative species are having a significant detrimental effect on the park's aquatic ecology: the New Zealand mud snail (*Potamopyrgus antipodarum*) and the parasite (*Myxobolus cerebralis*) that causes whirling disease in fish. Concern for zebra and quagga mussels (*Dreissena polymorpha* and *D. rostriformis bugensis*) invading the park continues to grow as other parks are now spending millions of dollars to control infestations.

In December, a new invasive species was discovered in the Boiling River soaking area adjacent to the Gardner River. The red-rimmed melania, *Melanoides tuberculatus*, is a small snail native to tropical Africa and Asia that was imported to the United States by the aquarium trade starting in the 1930s. It has become well-established in rivers from Florida to Texas and appeared more sparsely elsewhere. The possible impacts on the park's native invertebrates are not known. Studies are currently underway to determine the species' distribution within the park.

Since 2005, the park's Aquatic Invasive Species (AIS) program has gradually evolved into a visitor outreach and interdiction effort in which resource

management biological technicians and volunteers interview watercraft users and when necessary, conduct inspections and decontamination treatments. Park staff purchased a mobile cleaning unit in 2009, and have increased their vigilance in attempting to intercept watercraft from source locations and educate visitors about the problem. A significant achievement in 2009 was to further integrate the AIS program with other angler and boating permit programs operated from the park's backcountry offices and entrance stations. In the largest effort so far, the 2009 AIS program entailed 983 hours of work by paid NPS staff and 90 hours by volunteers.

Bears

About 150 grizzly bears (*Ursus arctos horribilis*) are thought to have territories that lie partly or entirely within the park. Unlike the grizzly bear, which is considered a threatened species under the Endangered Species Act, the park's population of black bears (*Ursus americanus*) is not closely monitored, but they are considered common in the park.

Bear Foods Monitoring

The annual availability and abundance of native bear foods has a strong influence on grizzly bear cub production and survival, and the number of incidents in which bears attempt to obtain human foods. Park staff monitor the availability of some key grizzly bear food sources: winter-killed carcasses, spawning cutthroat trout, and whitebark pine seeds. In 2009, bear foods were abundant throughout the park. Spring surveys found that ungulate carcasses were abundant on the northern range. A total of 53 ungulate carcasses were documented along 249 km of survey routes from April to early May, or an average of 0.21 carcasses/km (45 carcasses, or 0.32/km on the northern range).

The number of spawning cutthroat trout in Yellowstone Lake tributaries has decreased significantly since 1989, and few were counted in 2009. No evidence of bear fishing activity was found at the tributaries or at the inlet of Trout Lake, where the number of spawners (cutthroats and rainbow trout hybrids) has increased significantly since 2004. But the bears appear to have found other natural foods. In late spring and early summer, grizzly bears preyed extensively on newborn elk calves. A wide variety of



Grizzly bear along Obsidian Creek, April 24, 2009.

roots and vegetal bear foods were available throughout the summer. Bears were observed at 25 of the high alpine aggregation sites used by army cutworm moths (2004–2008 average: 22 sites). The abundance of whitebark pine seeds, available in the fall, was approximately twice the long-term average, and most bear scats observed during the fall contained whitebark pine seeds. However, whitebark pine is at risk of significant reduction in abundance due to whitebark pine blister rust and mountain pine beetle infestations. Of the 19 whitebark pine transects

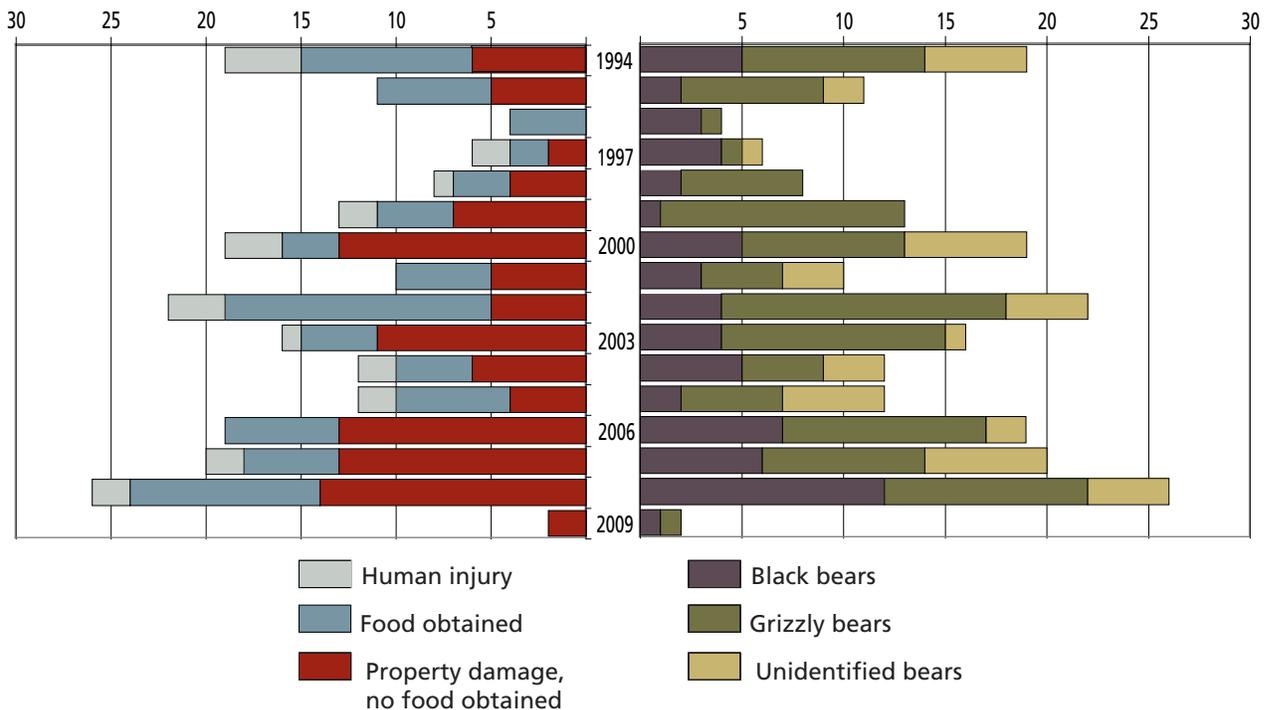
whose cones are counted annually for monitoring purposes, 10 are in YNP, and 17 of those 100 trees were dead in 2009 as a result of beetle infestation.

Bear Management

The good food year for bears in combination with sanitation practices intended to prevent bears from obtaining human foods and garbage helped limit the number of bear-human conflicts in the park to two in 2009. Both incidents resulted in damage to unoccupied tents in backcountry campsites, one by a black bear and the other by a female grizzly bear accompanied by a yearling. Five summer seasonal employees helped bear management staff keep park visitors and bears safe at 884 bear jams in the park in 2009. No bears caused human injuries, obtained human foods or garbage, or had to be relocated or euthanized in the park during the year. With a contribution from the Yellowstone Park Foundation, bear management staff installed a total of nineteen 30-cubic foot, bear-proof food storage boxes in three park campgrounds. They also made 42 presentations to various groups on topics including safety in bear country, the history of bear management in Yellowstone, grizzly bear food habits, grizzly bear recovery and delisting, bear hazing, and bear-jam management.

Grizzly Bear Status

All demographic measures required for delisting the Greater Yellowstone area (GYA) grizzly bear population as a threatened species under the Endangered Species Act, including the number of reproducing females, distribution of reproducing females, and mortality rates, were met in 2009. The size of the GYA grizzly bear population was estimated to be 582 by the Interagency Grizzly Bear Study Team (IGBST). Although the U.S. Fish and Wildlife Service concluded in 2007 that the GYA grizzly bear population had recovered sufficient numbers and distribution to be removed from the list of threatened species under the Endangered Species Act, a lawsuit filed by the Greater Yellowstone Coalition led to a court order in September 2009 to relist the species. The judge ruled that the multi-agency conservation strategy for grizzly bears in the GYA did not provide adequate regulatory mechanisms for ensuring the population’s long-term survival, and that the USFWS had not adequately addressed the long-term impacts of climate change and other factors on whitebark pine seeds, an important bear food. The USFWS is consulting with the Department of Justice to decide whether to file an appeal.



Types of bear-human conflicts and species of bear involved, Yellowstone National Park, 1994–2009. Substantial year-to-year fluctuations have occurred, but an overall increasing trend until the sudden drop in 2009.

Grizzly Bear Monitoring. The IGBST, which has representatives from the NPS, the USFWS, the U.S. Forest Service, the U.S. Geological Survey, and the states of Idaho, Montana, and Wyoming, monitors population numbers, distribution, habitat use, reproduction, and mortality. To help carry out this monitoring, the IGBST tries to maintain radio collars on 25 adult female grizzly bears in the GYA. During 2009, the IGBST maintained 16 trap sites in YNP at which 17 grizzly bears were captured a total of 25 times; 15 of the bears were radio-collared. Five black bears were also captured, of which one was radio-collared.

Reproduction. Based on aerial and ground surveys during the summer of 2009, the IGBST differentiated 42 females with 89 cubs of the year in the GYA (range since 2000: 31 to 52 females with 57 to 108 cubs). These sightings included 37 observations of 11 female grizzlies that had home ranges either wholly or partially in YNP and that were accompanied by a total of 23 cubs of the year (2 one-cub litters, 6 two-cub litters, and 3 three-cub litters). Females with young (cubs, yearlings, or two-year-olds) were observed in all 13 of the bear management units that are located partly or entirely in the park. The number of female grizzlies in the park that produce cubs has been relatively stable for more than a decade, suggesting that the park's grizzly bear population may have reached ecological carrying capacity.

Mortality. The IGBST documented 31 known and probable grizzly bear mortalities in the GYA during 2009 (average 2000–2008: 26). At least 24 of the deaths were human-caused, more than half of them hunting related. Both of the two grizzly bears whose carcasses were found in YNP in 2009 appeared to have died from natural causes. Bear management staff also investigated mortality signals received from 11 radio collars, but the signals all turned out to be coming from cast off collars, not dead bears. These investigations took from several hours for signals picked up near roads to several days for signals picked up in backcountry locations.

Birds

With the removal of the peregrine falcon and bald eagle from the federal list of endangered

and threatened species, no listed bird species reside in the park. However, bird monitoring in Yellowstone continued to focus on species of special interest in 2009. In addition to ground surveys, four aerial surveys were conducted from May through August to help monitor the nesting of bald eagle, osprey, trumpeter swan, and common loons.

Peregrine Falcons

Of the 23 known eyries monitored for evidence of breeding, 19 were occupied by a breeding pair, 14 of which fledged a total of 28 young.

Bald Eagles

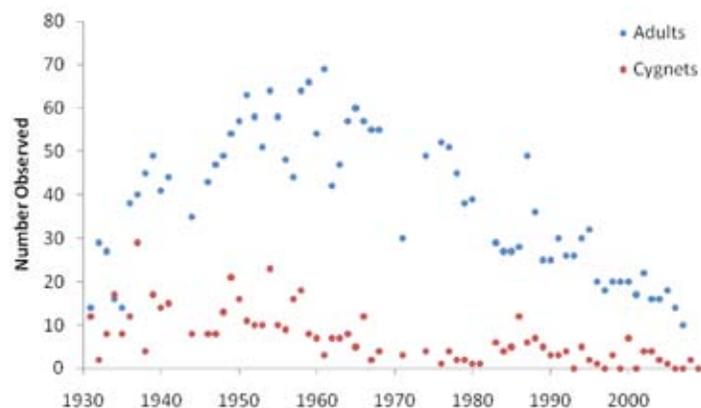
Of the 15 located bald eagle nests, six fledged a total of eight eaglets. The nine nests that did not produce fledglings were located in the Yellowstone Lake area, where reproduction has decreased in recent years, possibly because of reductions in cutthroat trout abundance or because of human disturbance.

Osprey

Of the 27 located osprey nests, 13 fledged a total of 28 young. The park's osprey population has been declining for the last decade. Only four osprey pairs nested on Yellowstone Lake and, like the bald eagles nesting there, none produced fledglings. A new study examined the availability of fish and the nest success of osprey and bald eagles in the Yellowstone Lake area in comparison to other parts of the park.

Trumpeter Swans

Both of the two swan nests located in the park during the breeding season failed during the incubation stage for unknown reasons in 2009. Because of the park's low trumpeter swan population and



Autumn counts of trumpeter swans in the park, 1931–2009.

productivity, starting in 2010, any area where swans are observed nesting will be closed to public access until August 15. The midwinter survey of the park, Paradise Valley, and Hebgen Lake counted a total 144 swans; this includes trumpeter swans that have migrated into the area from Canada for the winter. The number of swans in the park was thought to be 90, compared to an average winter count of 161 from 2002 to 2007.

Common Loons

The common loon is a species of special conservation concern in Wyoming and throughout much of the United States and Canada because of habitat loss and wetland contamination. The loon population in the park is one of the most southerly breeding populations in North America and one of the only populations breeding in Wyoming. Loons were surveyed at 11 previously occupied sites in July and August. Although the adult population observed in the park has remained stable, the number of nesting pairs and fledglings has decreased since 1987.

Other Surveys and Studies

Park staff conducted the annual survey of colonial nesting birds on the Molly Islands, continued a study of willow-songbird relationships that was initiated by Montana State University to establish a long-term songbird dataset, and set up transects to conduct surveys in areas that had recently undergone forest fire. During the annual breeding bird survey, which is an international effort to track population trends over time, 79 species and 1,844 birds of 79 species were documented on three routes in the park.

Ungulates

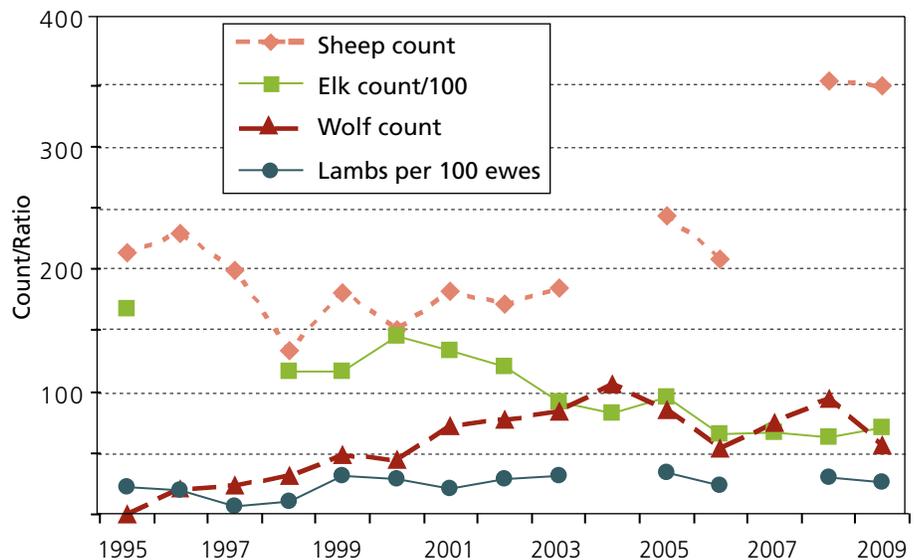
Bighorn Sheep

About 10 to 13 bands of interbreeding bighorn sheep occupy of steep, rocky terrain in the upper Yellowstone River drainage. Mount Everts receives the most concentrated

use by bighorn sheep year-round, but they also use habitat that extends more than 20 miles north of the park boundary. From the 1890s to the mid-1960s, the bighorn sheep population fluctuated between 100 and 400. The count had reached a high of 487 in 1981, but a pinkeye epidemic caused by *Chlamydia* reduced the population by 60% the following winter. Counts did not increase significantly during the next 15 years and reached a low of 134 sheep following the severe winter of 1996–1997. Since then, the overall trend has been upward to 353 sheep in 2008. Recruitment dropped to 7 to 11 lambs per 100 ewes during the winters of 1996–1997 and 1997–1998, but since then has fluctuated between 21 and 34 lambs per 100 ewes. Although wolves occasionally prey on bighorn sheep, the population has increased since wolf reintroduction began in 1995. Long-term monitoring will show whether changes in the sheep population size are correlated with changes in the northern range elk herd, which has dropped 50% since 1994.

Bison

Park staff participated for the 10th year in the Interagency Bison Management Plan with the state of Montana and the U.S. Department of Agriculture Animal and Plant Health Inspection Service and Forest Service. The plan is designed to manage the risk of brucellosis transmission from bison to cattle,



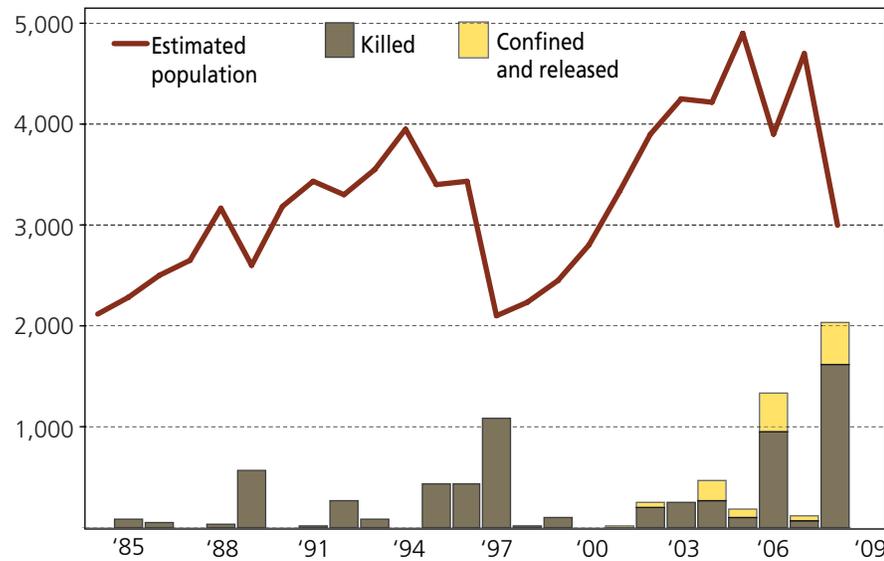
Winter counts of bighorn sheep, lambs, elk, and wolves on the northern range, 1995–2009. Because of variations in aerial survey conditions from year to year, counts provide a variable underestimate of actual population size.

conserve the ecological role of the bison population in the ecosystem, and allow for gradually increased tolerance of bison outside the park on national forest land. Yellowstone National Park served as the lead agency this year in coordinating and documenting interagency actions in carrying out the IBMP.

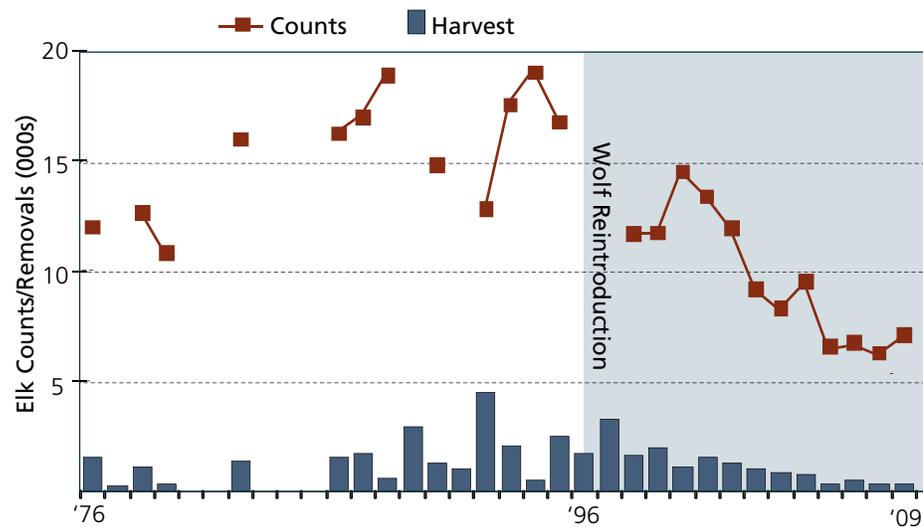
Although few bison migrated to lower elevation ranges along the park boundary year during the winter of 2008–2009, approximately 580 bison approached the west boundary in the spring, resulting in up to 400 bison on ranges outside the park in mid-May. A large interagency operation moved the bison back within the park and no bison had to be removed to meet brucellosis risk management goals in 2009. One bison was harvested outside the park in Montana by a licensed hunter. The population size was estimated at 3,300 based on aerial surveys in June and July, compared to 3,000 bison in summer 2008 and 2,900 adult and yearling bison in late winter 2009. The peak population estimate of 4,900 bison was recorded in the summer of 2005.

Elk

Yellowstone’s largest elk herd winters on range along and north of the park’s Montana boundary. The Northern Yellowstone Cooperative Wildlife Working Group, which includes park staff and representatives from Montana Fish, Wildlife and Parks, the U.S. Forest Service, and the U.S. Geological Survey, conducts aerial surveys of this northern Yellowstone elk population each winter. The winter count, which was approximately 17,000 in 1995, has



Bison killed in boundary control operations or by hunters, bison temporarily confined at the boundary, and the estimated population the following summer.

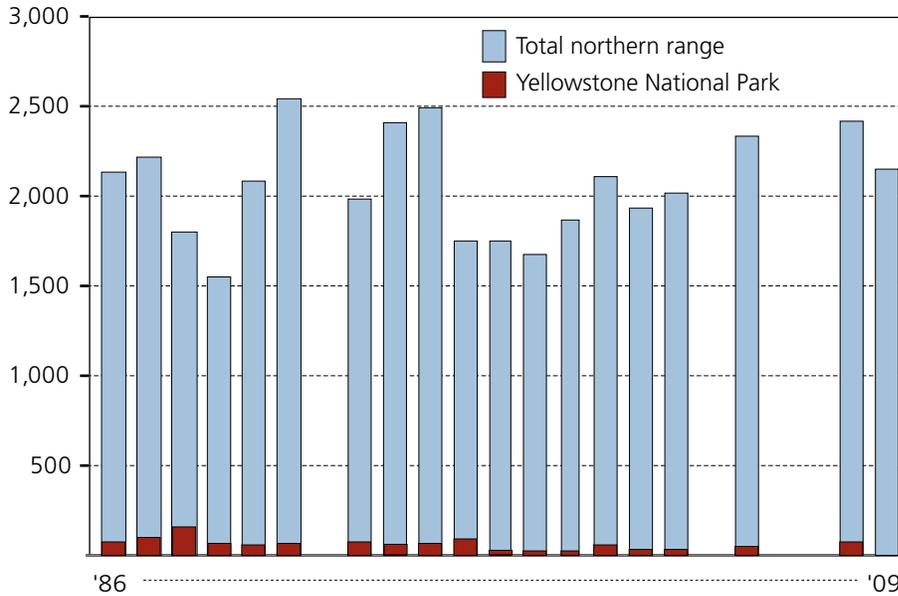


Winter counts and hunting harvests of the northern elk herd in Yellowstone National Park and adjacent areas of Montana, 1976–2008. Counts were not adjusted for sightability.

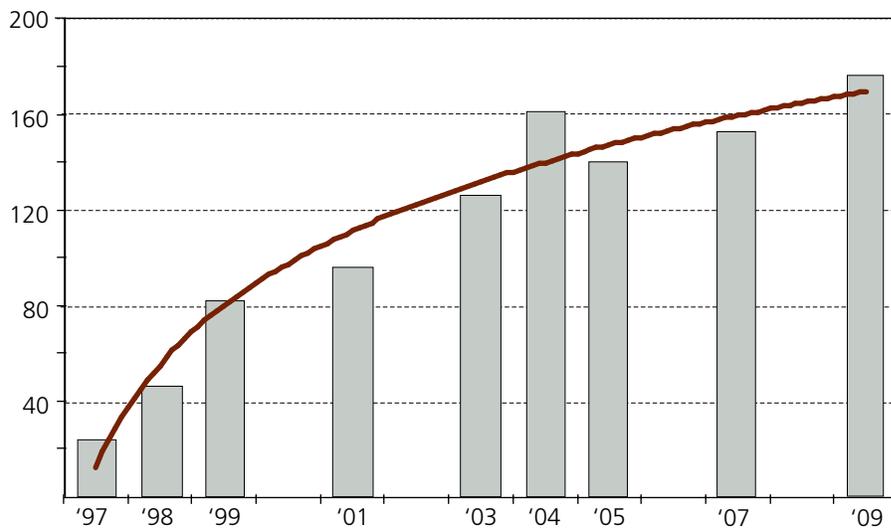
fluctuated between 6,000 and 9,000 since 2003 and was 7,109 in 2009. The decline has been attributed to predation by reintroduced wolves, a growing bear population, hunter harvest, and possibly drought-related effects on pregnancy and survival. The state of Montana has reduced the number of antlerless permits issued in recent years so that hunting now has little impact on population size.

Mule Deer

Aerial surveys conducted in the spring of 2009 by the Northern Yellowstone Cooperative Wildlife



Spring mule deer counts in the Gardiner Basin winter range, 1986–2009 (no surveys in '93, '04, '06, or '07).



Counts of mountain goats in Yellowstone National Park and adjacent areas of Montana and Wyoming, 1997–2009.

northern areas of the park; aerial counts of goats inside or within one kilometer of the park have increased from 24 to 178 since 1997. The total population in that surveyed area was estimated to be 200 to 300 goats in 2009. This has raised concerns about the apparent effects on native alpine vegetation and competition with the native bighorn sheep. In 2009, a team of biologists and university faculty representing the National Park Service, the Wyoming Game and Fish Department, Montana Fish, Wildlife and Parks, and Montana State University initiated a research project on mountain goat and bighorn sheep ecology to identify areas where bighorn sheep and mountain goats are currently sympatric and where potential future mountain goat range expansion may overlap bighorn sheep ranges. Through a cooperative agreement with Idaho State University, a three-year NRPP-funded project is continuing to evaluate potential mountain goat impacts on alpine vegetation in the northeast portion of the park.

Working Group recorded 2,154 mule deer on the northern range in and outside the park, the third highest count since 1996. While the relative distribution of mule deer across their winter range has remained similar over the last two decades, the population appears to have increased in recent years.

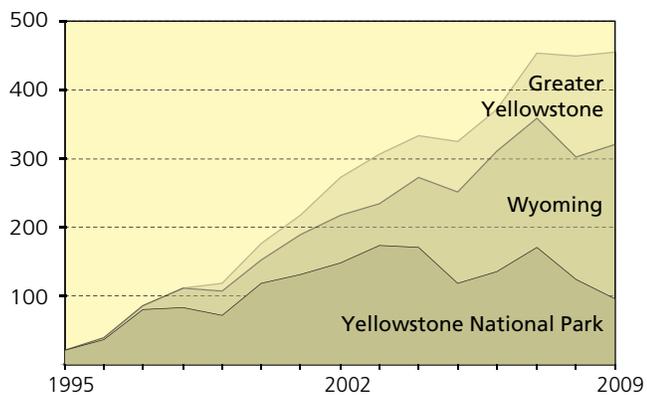
Mountain Goats

Descendants of mountain goats introduced in Montana during the 1940s and 1950s have colonized

Wolves

Population Status

While the total wolf count in the Greater Yellowstone area has continued to increase since reintroduction began in 1995, reaching 455 in 2009, the number of wolves in Yellowstone National Park has trended downward since reaching 174 in 2003. As of the end of 2009, 96 wolves were known to be



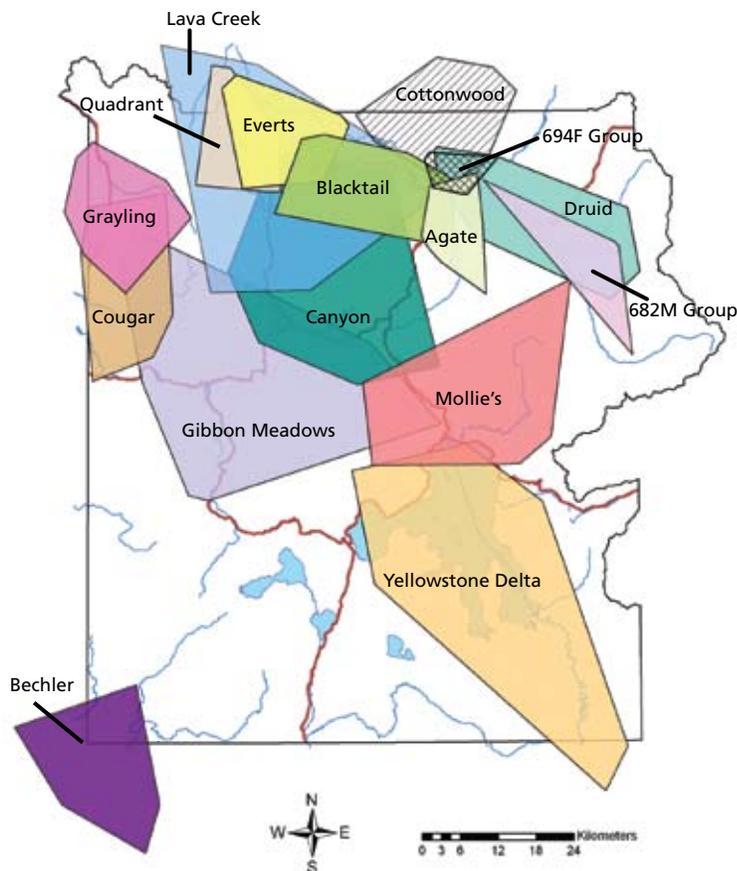
Greater Yellowstone wolf population, 1995–2009.

occupying territories located mostly in Yellowstone, and most of them belonged to one of 14 packs which ranged in size from 3 to 17 and averaged 7.1, down from the long-term average of 9.8 wolves per pack.

Eleven of the packs are known to have produced 44 pups, of which 23 are known to have survived the summer. Unlike other years when pup production was poor, distemper did not appear to be the cause of the poor recruitment in 2009.

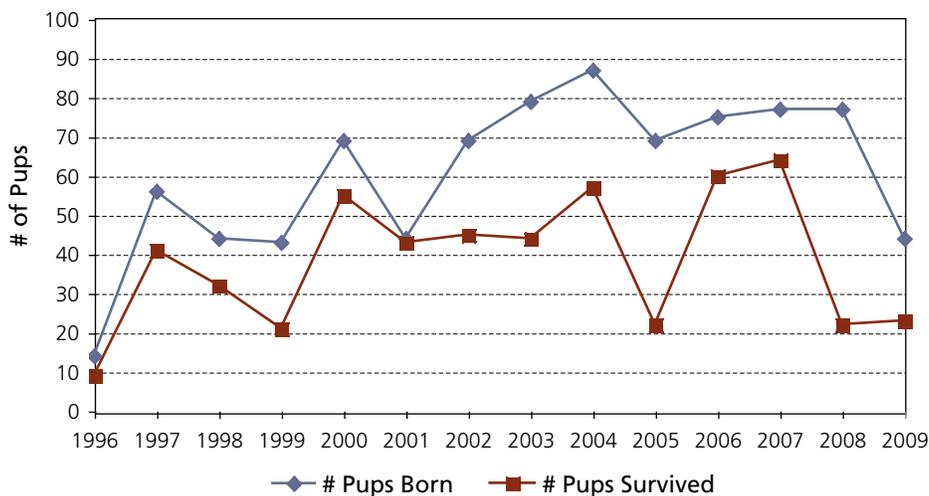
Intra-pack fighting, malnutrition, and mange are the most likely causes of the population decline within the park. Sarcoptic mange is an infectious skin disease caused by a mite that was introduced in the West in the early 1900s to reduce wolf and coyote populations; it is not necessarily fatal but can make an animal more vulnerable to death from other causes.

With a total of more than 1,600 wolves in Idaho, Montana, and Wyoming, the Northern Rocky Mountain recovery areas have met the demographic



Wolf packs that had some or all of their territory within Yellowstone National Park in 2009.

criteria established for a recovered wolf population, and in 2009 the U.S. Fish and Wildlife Service removed the gray wolf from the endangered species list in Idaho and Montana, which had each prepared wolf management plans that were approved by the USFWS.



Known number of pup births and pups surviving at the end of the summer in Yellowstone National Park, 1995–2009.

Wolf Management Activities

About one-third of the wolves in the park wear radio collars for research and monitoring purposes, including 11 wolves that were captured and collared in 2009. Wolf management activities included closing the area around two den sites to public access and using beanbag rounds and cracker shells to haze wolves in a pack that was frequenting the Mammoth Hot Springs developed area and

the Hayden Valley road corridor. For the first time since wolf reintroduction began, a wolf in the park had to be killed because it was approaching people, probably because it had been fed.

Predation

Park staff detected 365 wolf kills in 2009, including 302 elk (83%), 19 bison (5%), and 17 deer (5%), as well as 6 wolves, 4 pronghorn, 3 coyotes, 2 red foxes, 1 moose, 1 bighorn sheep, 1 Canada goose, 1 bald eagle, and 8 unknown prey. Although the number of elk killed per wolf has declined in recent years, the increasing proportion of the elk killed that are bulls (29% in 2009) has kept the kilograms consumed per wolf per day relatively stable since 1995.

Genetics

An analysis of genetic diversity and gene flow in the Northern Rocky Mountain recovery areas was completed in 2009 and submitted for publication by park staff in collaboration with colleagues from the U.S. Fish and Wildlife Service and the University of California, Los Angeles. The degree to which subpopulations are genetically structured and connected, along with the preservation of genetic variation, are important conservation concerns. This study, which analyzed genetic samples from 555 wolves in the three recovery areas (Greater Yellowstone, Northwest Montana, and Central Idaho), including the 66 introduced population founders, found that the populations had maintained high levels of variation and low levels of inbreeding.

Yellowstone Wildlife Health Program

The Yellowstone Wildlife Health Program (YWHP) is a partnership established by the NPS, Montana State University, and the University of California–Davis School of Veterinary Medicine Wildlife Health Center in 2007 to monitor wildlife diseases and health indicators in the Greater Yellowstone area. The program is using five-year funding provided by the Yellowstone Park Foundation to help facilitate cooperation among scientists seeking grants for wildlife health research and develop on-site veterinary services, diagnostics, and laboratory facilities.

Amphibian Disease Surveillance

Disease has been identified as one of the most important factors causing global amphibian declines. The YWHP is collaborated with Idaho State University and the U.S. Geological Survey to (1) create and a database containing historical and current disease outbreak information in Yellowstone National Park; and (2) initiate an outbreak investigation plan for responding to observed amphibian mortality events. During 2009, four site visits were made from May to August based on reports of dead amphibians and areas where amphibian die-offs were known to have occurred previously. Dead and moribund amphibians were sent to the University of California Veterinary Diagnostic Laboratory. Ranavirus was implicated in one of the deaths. Ranavirus typically affects larval amphibians (tadpoles) due to dense aggregations in drying ponds and die-offs can occur at the same location and time in subsequent years. *Batrachochytrium dendrobatidis* was also identified and may have contributed to some amphibian deaths.

Vector-Borne Disease Surveillance

To improve understanding of the potential public health risks in the park, the YWHP initiated a disease vector assessment survey in 2009 in collaboration



Technical Sergeant Karon Rizner (USAF) analyzes samples for vector-borne disease agents.

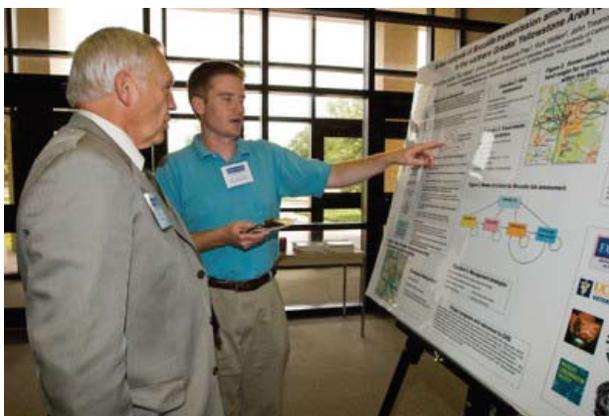
with the U.S. Air Force Research Laboratory in San Antonio, Texas. Vector-borne diseases could be transmitted to humans and wildlife by existing insect vectors or nonnative disease agents could be introduced into a wildlife population by humans. Insect vector surveillance will provide park managers with information needed to make decisions for preserving the park and protecting animal and human populations.

Uinta Ground Squirrel Disease Surveillance

Since the 1970s, there has been a worldwide resurgence of vector-borne diseases which are typically transmitted by biting arthropods such as ticks and fleas. Rodents are important host species of blood-feeding arthropods, which may transmit infectious diseases to animals and humans. In Yellowstone, Uinta ground squirrels are widely distributed and may play an important role in maintaining diseases such as plague and tularemia. In addition, because of the squirrel's broad distribution and overlap with bison and elk calving areas, the species may serve as sentinels for brucellosis management. During 2009, the Yellowstone Wildlife Health Program collaborated with the Agricultural Research Service and the Centers for Disease Control and Prevention to identify exposure to infectious disease organisms in Yellowstone's Uinta ground squirrel populations. All test results for tularemia were negative. Two ground squirrels tested positive for plague at low levels within the same site which could indicate a previous plague outbreak.

Brucellosis Transmission Risk Assessment

Based on the timing and location of bacterial shedding by bison and elk, the YWHP is assessing the risk of brucellosis transmission among bison, elk, and cattle in the northern part of the Greater Yellowstone area. Preliminary results show that population size and winter severity were the major factors influencing bison to move to lower elevation winter



Dr. Brant Schumaker (right) presents his brucellosis risk assessment model.

grazing areas which overlap with federally regulated cattle grazing allotments. Increasing population size resulted in higher bison densities and increased bacterial shedding. Under current management practices, bison risk to cattle grazing in the northern portion of the Greater Yellowstone area is expected to be small, with elk presenting most of the risk, especially during the late gestation period for elk.

Research on Russian Brucellosis Vaccine

Through the Civilian Research and Development Foundation, a nonprofit organization that promotes international scientific collaboration, the YWHP provided funding to Russian vaccinologists to conduct the first comprehensive review of laboratory and field studies on the most widely and successfully used brucellosis vaccine in many regions of the Russian Federation. A research manuscript has been developed in cooperation with the USDA Agricultural Research Service and submitted to *Animal Health Research Reviews*. Publishing this report in an English-language, peer-reviewed scientific journal will help provide the scientific basis for ultimately testing the vaccine in bison at the USDA National Animal Disease Center in Iowa.

PART III

Professional Support

This section summarizes the 2009 accomplishments of Yellowstone Center for Resources staff who provide services for other YCR branches and park divisions:

- Environmental Quality
- Spatial Analysis Center
- Research Permit Office
- Science Communication
- Funding and Personnel

Environmental Quality

A major focus of the Environmental Quality Branch in 2009 was ensuring the compliance of 15 projects funded by the American Recovery and Reinvestment Act of 2009, including construction of a micro-hydro power plant, a wastewater treatment plant, employee housing, and trail repairs. The branch was also involved in the following areas:

- completing the Environmental Assessment (EA) with a Finding of No Significant Impact (FONSI) for the Lamar River Bridge replacement;
- implementing the EA for the Wireless Communication Services Plan through the formation of a committee to review wireless communications requests;
- beginning the drafting of the EA for the Norris to Golden Gate road reconstruction project with the goal of avoiding wetlands, thermal areas, and archeological resources while improving parking areas and pullouts;
- reviewing the EA for the National Ecological Observatory Network, in which Yellowstone will be participating, to monitor the effects of climate change on biological resources;
- assisting other park staff in preparation of the Tower Roosevelt Comprehensive Plan EA and FONSI and drafting the Bison Remote Vaccination Environmental Impact Statement;
- completing approximately 40 National Environmental Policy Act Categorical Exclusion documents for projects such as installation of



MSgt. Paul Martin and Maj. Keith Blount examine a Uinta ground squirrel for fleas.

- utilities, hazard fuels reduction, and fencing;
- completing approximately 50 National Historic Preservation Act consultations with State Historic Preservation Officers for projects affecting historic properties in the park, including upgrades to the Fishing Bridge Museum;
- submission of annual reports to the U.S. Fish and Wildlife Service on road improvement and fire-related activities as they could affect threatened and endangered species.

The Environmental Quality Branch also continues to work with other park staff to improve how compliance is integrated efficiently into the project planning process.

Benefits Sharing

Following legal clearance from the Department of the Interior's Office of the Solicitor, the Benefits-Sharing Final Environmental Impact Statement was released to the public on November 27, 2009. The key issue examined in this first-ever servicewide EIS is whether the NPS should share in scientific and economic benefits when researchers make a commercially valuable discovery or invention as a result of their fieldwork in a national park. The EIS presents three alternatives:

- The Preferred Alternative would require researchers who study park specimens to enter into benefits-sharing agreements with the NPS before using their research results for any commercial purpose. Engaging researchers in benefits-sharing

agreements could provide the parks with scientific benefits, in-kind services, royalties or other monetary benefits to be used for conservation-related purposes.

- Another alternative would prohibit scientific research using specimens from a national park if associated with the development of commercial products.
- The No-Action alternative would allow research that may lead to commercial products to continue in the parks without any obligation to share the resulting benefits with the NPS.

The decision document for the final EIS is expected to be released in early 2010.

With assistance from the Department of the Interior's Office of the Solicitor and staff from the Assistant U.S. Attorney's Office, the EIS team also responded to multiple appeals related to the Edmonds Institute 2005 Freedom of Information Act request, which required the review of thousands of documents and responses on tight deadlines.

Spatial Analysis Center

The Spatial Analysis Center provides a variety of GPS (global positioning system) and GIS (geographic information system) services to park staff and cooperators by interpreting technology and technical data to suit a variety of information needs. Major achievements in 2009 included:

- **Spatial database of park utilities:** staff worked with Maintenance staff and collected data through fieldwork, interviews, and paper plans to map utilities in all park developed areas and link them to the Facilities Management Software System database, including nearly 3,400 water features and 2,000 sewer features.
- **Spatial database of park buildings:** staff worked toward the long-term goal of having an accurate spatial representation of every building in Yellowstone and documenting the location of buildings that no longer exist for use in comprehensive planning, the Park Asset Management Plan, and the Historic Structures Management Plan.
- **Computer models of developed areas:** staff completed three-dimensional models for the Mammoth, Lake, Tower, Canyon, and Old Faithful areas for use in environmental assessments,

including buildings, trees, and terrain. GIS staff also support the EA process by supplying planners with maps and analyses. Enabling users to view the consequences of different planning scenarios on the landscape increases the likelihood that everyone will understand the proposals and accurately foresee the end results.

- **Exotic plants:** staff worked with Resource Management to improve the quality of the spatial data on exotic plant locations throughout the park and the consistency of reports from different areas, which will improve the analysis of monitoring data and measurements of the efficacy of control efforts.
- **Wildland fires:** staff provided current maps of fires in the park for fire crews, the Public Affairs Office, and the park's website.
- **Project-specific maps:** staff helped produce an analysis of winter forage availability for bison based on satellite and climate data; the proximity of grizzly bears, occupied campsites, and hikers based on data from GPS collars, hand-held GPS units, and the backcountry campsite database; maps of pika habitat, wikiup locations, and areas seasonally closed for bird nesting; maps for the 2009 presidential family visit; and locations of park residences for the 2010 census.

Research Permit Office

Scientists from around the world are attracted to studying Yellowstone's unique resources. The Research Permit Office (RPO) issues and manages approximately 200 research permits each year, which is one of the highest volumes of research permits within the NPS. RPO staff also monitor fieldwork to ensure it does not alter park resources or conflict with other park missions, and communicate study results to park managers to support informed decisions.

Research Permits

The RPO issues and manages permits to researchers to conduct scientific studies in a variety of disciplines. In 2009, the RPO received approximately 60 permit inquiries and processed 28 new project requests. The RPO also managed the park's research dormitory and provided low-cost housing to 38 groups.

Fieldwork Assistance

This year RPO staff assisted 20 research groups in the field. These visits help staff better understand a project's specific objectives and the implications results may have on park management. They also ensure researchers use minimum impact research techniques and that their efforts do not alter park resources. Among the projects RPO staff visited that addressed issues of particular interest to park management were the entomologists from the research laboratory at Brooks Air Force

Base. The researchers searched for "disease vectors" (fleas, ticks, and mosquitoes, in this study) that can transmit diseases such as plague, rabbit fever, and West Nile virus to humans, though no human cases have ever been confirmed in the park. The RPO also assisted fisheries biologists from the USGS Northern Rocky Mountain Science Center while they tested new equipment developed by a biological consulting firm that can vacuum nonnative lake trout eggs from their spawning grounds on the floor of Yellowstone Lake without disturbing sediments and cobble.

Sharing the Results

In 2009, researchers published roughly 80 journal articles related to their Yellowstone research, several of which were accepted to prestigious journals like *Science* and *Proceedings of the National Academy of Sciences*. The RPO also widely distributed the articles to park staff, public libraries, and online databases that house NPS study results. Several students earned master's or PhD degrees related to their Yellowstone studies and RPO staff distributed the resulting theses and dissertations.

Yellowstone Researcher Check-in

The RPO also worked with the Greater Yellowstone Science Learning Center staff on the



MSgt. Martin, LCdr. and Yellowstone Public Health Consultant George Larsen, and Bob Wesselman prepare to deploy traps for ticks along Upper Blacktail Creek.

design of a web-based application that, beginning in 2010, will enable researchers to post field itineraries online instead of calling each individual district to notify rangers of their field plans.

Science Communication

Through a variety of print and electronic communications, YCR's science communication team contributes to the scientific body of knowledge about the park, discussion of park issues and policies by a variety of participants, and promote resource conservation and visitor enjoyment through improved understanding of ecological issues.

Greater Yellowstone Science Learning Center

The Greater Yellowstone Science Learning Center (GYSLC) is a partnership among the Yellowstone Center for Resources, the Greater Yellowstone Inventory and Monitoring Program, the Rocky Mountains Cooperative Ecosystem Studies Unit, Montana State University, the Sonoran Institute, the Yellowstone Association, the Yellowstone Park Foundation, and Canon U.S.A., Inc., as part of the *Eyes on Yellowstone* is made possible by Canon program. Its primary purposes are to promote

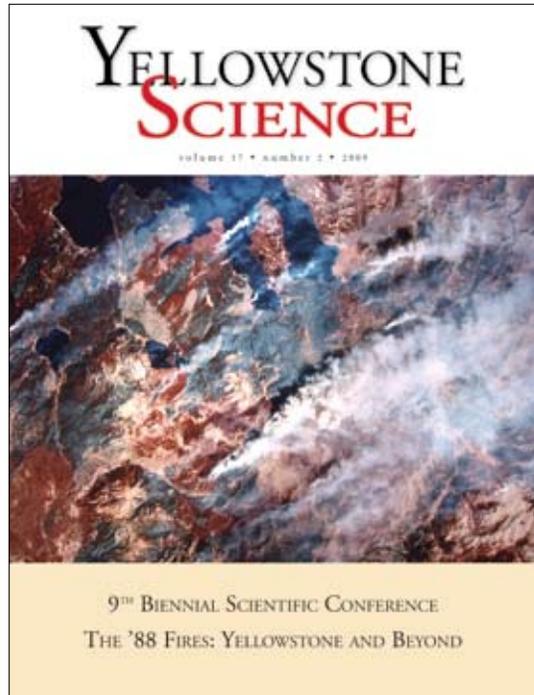
mission-oriented research in the Greater Yellowstone Inventory and Monitoring Network (Yellowstone and Grand Teton national parks, John D. Rockefeller, Jr. Memorial Parkway, and Bighorn Canyon National Recreation Area), and to explain the need for and results of research in the network to park managers, researchers, educators, students, and interested public. It has been recognized as a servicewide model for a website strategy for NPS Research Learning Centers (RLC) and Inventory and Monitoring Networks. This website idea has become

so popular among RLCs across the nation that in July 2009, Yellowstone sponsored a training to get five more RLCs started on similar website efforts.

During 2009, the website (www.greateryellowstonescience.org) continued to undergo significant improvements to its structure and functionality. In a joint effort with the Learning Center of the American Southwest, a developer hired through a Cooperative Ecosystem Studies Unit (CESU) agreement with Montana State University in 2008 and a webmaster hired through a CESU agreement with the Sonoran Institute continued to improve the site. Staff also developed content for 20 additional topics on the website and updated information on existing topics, gave a presentation at the 2009 George Wright Conference about the website, and assisted members of the Inventory and Monitoring Network and other park units with their products.

Yellowstone Science

The addition of the Yellowstone Association's mailing list increased the circulation of *Yellowstone Science* to nearly 4,000 in its 17th year of publication. Among the highlights this year was a double issue providing information presented at the 9th Biennial Scientific Conference on the Greater Yellowstone Ecosystem, "The '88 Fires: Yellowstone and Beyond." Other topics included the effects of



development and tourism on geyser basins, the discovery of unusual salamanders, an interview with historian Paul Schullery, who retired from the NPS in December 2008, an analysis of the relationship between willow growth and songbird community diversity, and changes in land use in the Greater Yellowstone area.

Biennial Scientific Conference

YCR staff began planning the 10th Biennial Scientific Conference on the Greater Yellowstone Ecosystem to be held October 11–13, 2010, at the Mammoth Hot

Springs Hotel. The conference theme, "Questioning Greater Yellowstone's Future: Climate, Land Use, and Invasive Species" was developed by the program committee after consultation with the park superintendent. In preparation for the conference, YCR staff arranged a workshop on "Climate Change, Land Use Change, and Invasive Species as Drivers of Ecological Change in the Greater Yellowstone Area" in Bozeman, Montana, in November 2009 and field trip to the park. The goal of the workshop, which included more than 90 government, independent, and university-affiliated scientists and managers was to identify the high-priority science needs for the next 10–20 years.

Other Publications and Assistance

In addition to miscellaneous flyers, maps, presentations, and graphics for park staff, other projects in which the science communication staff had a primary role included:

- editing and design of annual reports for the Wolf Project, the Yellowstone Fisheries and Aquatic Sciences program, and Yellowstone Center for Resources activities;
- writing and design of the first-of-its-kind Superintendent's 2008 Report on Natural Resource Vital Signs, which presented research findings and data on more than two dozen

indicators selected to monitor the condition of the park’s natural resources;

- design, layout, and printing of the bison parturition report, “Yellowstone Cutthroat Trout: Conserving a Heritage Population in Yellowstone Lake,” and the lake trout workshop report;
- completion, printing, and distribution of the Servicewide Benefits-Sharing Final Environmental Impact Statement.

FY09. This compares to an average of 60% for the period FY95–08.

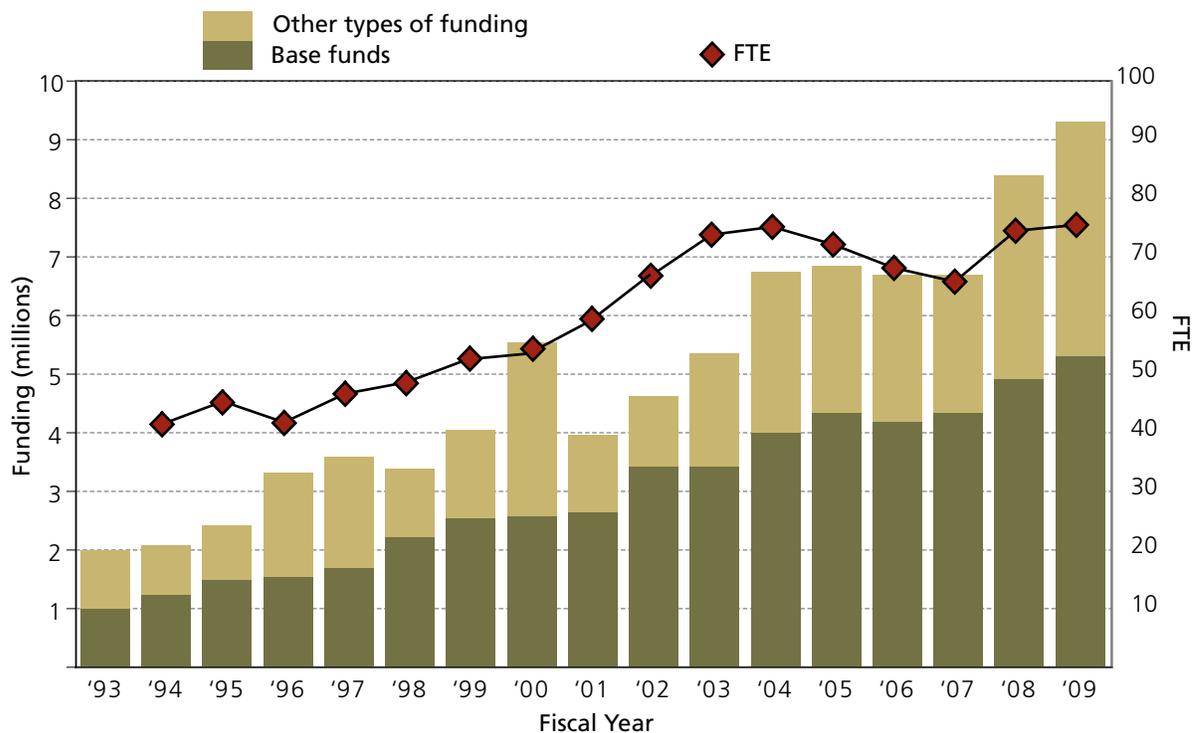
Additional Funding

Recreation Fee Demonstration Funds. The fee demo program provided \$915,000 in FY09 for four new projects: restoration of Yellowstone Lake cutthroat trout, reconstruction of the flood-damaged Clear Creek fish weir, a biological inventory of species in Yellowstone Lake, and use of Montana Conservation Corps crews and Student Conservation Association interns for nonnative plant control along road corridors and in developed areas of the park. Visitor fees also provided \$709,250 for 11 ongoing projects: renovation of and improvements to interpretive exhibits along the Nez Perce Trail, northern range riparian studies, a westslope cutthroat fishery conservation project, improvement of collections storage and additional visitor service assistance at the Heritage and Research

Funding and Personnel

Base Operating Budget

The Yellowstone Center for Resources was allocated a FY09 base operating budget of \$5,298,700. The increase of \$381,000 over FY08 funding levels included funds received to partially cover the annual pay cost increase and the reallocation of park base funds for lapsed positions back to the divisions. The base operating budget accounted for 57% of the YCR total for



YCR funding and full-time equivalent staff (FTE), FY1993–2009. “Base funds” from the NPS’s annual congressional appropriation are intended to cover each park’s basic operating costs; about 70–75% of YCR’s base funds are used for permanent employees’ salaries and benefits. Other types of funding include project-specific funds from the NPS and other federal agencies, fee revenues, and donations. The NPS provided a large increase in one-time funding in FY2000 for preparation of environmental impact statements on bison management and benefits sharing. YCR staff and base funding increased in FY2008 partly as result of a park-wide reorganization that transferred several work units to the division.

Center, a condition survey of historic structures with high visitor use, hazard tree reduction and exotic plant control programs, and the Gardiner Basin wildlife habitat restoration project. Since the YCR began receiving fee demo money in 1997, about \$4.5 million has been allocated from this funding program for 31 different projects.

Fishing Fee Program. The YCR received authorization to use \$337,500 from fishing permit fee revenue to cover part of the \$1,016,900 total cost of the Fisheries and Aquatic Sciences program in FY09.

Federal Lands Highway Program. Federal Highways funded \$647,800 for natural resource inventories, archeological surveys, and resource compliance along the road corridors in the park scheduled for major repair or reconstruction in the near future, and to control nonnative plant species in the completed construction areas undergoing revegetation.

Special Emphasis Program Allocation System. The Branch of Cultural Resources successfully competed for a total of \$349,900 in special emphasis program funding that was used to perform cyclic maintenance on the historic map and photograph collections, support two museum cataloging projects, continue work on an archeological survey of the Nez Perce National Historic Trail and a study of the traditional use of wickiups in the park, establish a Native American internship pilot program, and begin an archeological inventory and assessment of the east shore of Yellowstone Lake. The special emphasis program also provided \$106,700 to the Branch of Natural Resources for several ongoing air quality monitoring projects, the second year of a three-year study on mountain goat habitat vegetation, and the second year of a three-year project to evaluate the effectiveness of grizzly bear management closures.

Other Park Service Funds. The YCR continued work on the Benefits-Sharing EIS in FY09 with funds provided by the servicewide planning office of the NPS (\$105,700). The remaining national Centennial Challenge Initiative program funds (\$31,400) were expended to complete an all-taxa biodiversity inventory of Lake Yellowstone, the Greater Yellowstone Science Learning Center project, and a collections preservation project.

Other Federal Funds. A total of \$593,800 was provided to Yellowstone from other federal agencies,

most of it from the Bureau of Land Management's Joint Fire Sciences Program (\$402,800) for YCR to coordinate a study between federal partners and three universities on bark beetle infestation effects on fuels and fire hazards. The U.S. Fish and Wildlife Service provided funds for increased monitoring of grizzly bears (\$121,300) in the wake of their removal from the endangered species list, and the U.S. Department of Agriculture's Animal and Plant Health Inspection Service funded a brucellosis risk assessment study for the Greater Yellowstone area.

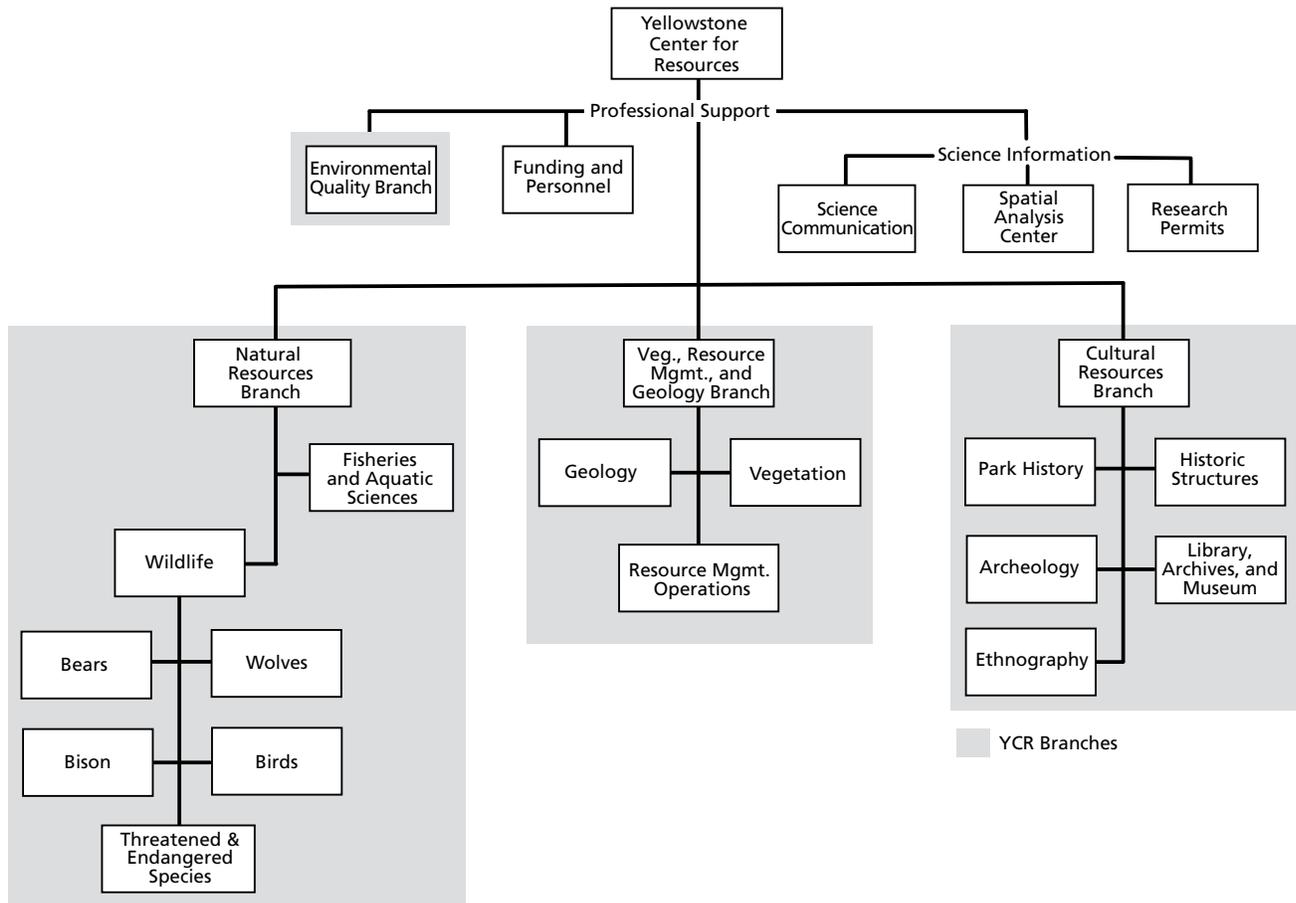
Private Funds. A total of \$215,900 was donated to the park by private organizations or individuals in support of various YCR projects, including the wolf recovery program, cultural resource preservation projects, a project to control aquatic nuisance species, studies of Yellowstone's northern range riparian habitats, and support for the Greater Yellowstone Science Learning Center and Yellowstone Wildlife Health Initiative. Most of this funding (\$196,900) came through the Yellowstone Park Foundation.

Administration

Personnel. A total of 132 people were on the YCR payroll for all or part of FY09, which was equivalent to 76 full-time employees. Of the 306 personnel actions processed by the YCR in FY09, these were of special note:

- John Treanor appointed to Term GS-09 11/7/08
- Rick McAdam transferred to Concessions 11/09/08
- Troy Davis resigned 11/22/08
- Paul Schullery retired 12/20/08
- Dan Mahony transferred from Fish to Geology 12/20/08
- Doug Smith promoted 12/21/08
- Ann Johnson retired 1/3/08
- Tami Blackford temporary promotion to cultural resources chief 1/4/09
- Barbara Cline and Becky Wyman promotions 1/4/09
- Bridgette Guild promotion to registrar 4/12/09
- Chris Overbaugh permanent appointment 7/19/09
- Kerry Murphy transfer to U.S. Forest Service 8/15/09
- Virginia Warner resigned 8/29/09
- Tobin Roop EOD 9/13/09

Yellowstone Center for Resources Organization as of December 2009



Assistance Agreements. Staff processed 62 assistance agreements and task orders in FY09, totaling obligations of \$2,854,400, of which 21% was used for historic structures, archeological surveys, and other cultural resources projects; 21% was devoted to vegetation research and restoration projects; 17% went toward the administration of the Montana Water Compact and geothermal monitoring plan; and 14% to science information and communication projects, including website development for the Greater Yellowstone Science Learning Center, an all-taxa inventory of Yellowstone Lake, and the development of a Native American internship program. Another 12% each went toward investments in wildlife projects and aquatic resources studies, with the remaining 3% devoted to research in

support of winter use studies and control of nonnative plants.

Procurement Actions. Staff processed 687 procurement actions. Of those, 190 purchase requests were prepared in the Interior Department Electronic Acquisition System to request acquisition services from the Yellowstone Procurement and Contracting Office, while 497 acquisitions were accomplished primarily through administrative staff credit card orders, for a total of 687 procurement actions in FY09, resulting in approximately \$1,164,300 in contracting and micro-purchasing expenditures.

Clerical Support. Staff processed 979 pieces of correspondence and 281 travel authorizations in FY09.

Yellowstone Center for Resources, Funding History (FY 1993–2009)

National Park Service Funds												
YCR Base Increase	FY	Nat Res Project Funds		Cult Res Project Funds	FLHP	Fish Fee	Fee Demo	Other NPS	Other Federal	Private	Total	% Soft Funded
		Park Base	Funds									
	93	1,004,600	16,000	—	—	—	—	785,000	188,000	20,000	2,013,600	50%
245,400	94	1,250,000	260,000	33,200	43,300	—	—	320,600	79,600	10,000	2,061,700	39%
250,000	95	1,500,000	420,000	45,000	303,600	—	—	59,800	20,000	5,300	2,418,700	38%
44,100	96	1,544,100	404,000	201,100	626,700	—	—	157,800	65,000	31,500	3,304,700	53%
130,000	97	1,674,100	204,000	228,400	433,700	340,000	—	42,700	398,300	48,000	3,582,600	53%
571,500	98	2,245,600	130,500	242,100	330,800	31,000	—	24,000	65,300	37,700	3,391,800	34%
286,300	99	2,531,900	—	221,900	396,500	298,000	—	152,900	105,200	56,700	4,048,100	37%
36,700	00	2,568,600	237,500	101,000	214,900	631,000	—	1,418,000	41,300	52,700	5,545,000	54%
93,300	01	2,661,900	297,000	216,700	409,000	—	—	—	15,000	85,500	3,970,200	33%
772,900	02	3,434,800	293,000	198,700	293,200	6,000	—	—	11,700	126,400	4,625,700	26%
(16,100)	03	3,418,700	101,000	326,300	431,000	103,000	—	454,400	24,000	224,300	5,332,700	36%
569,700	04	3,988,400	92,600	470,400	623,500	133,000	—	855,000	22,400	229,200	6,747,100	41%
375,700	05	4,364,100	218,000	676,900	495,900	167,700	—	367,800	23,700	181,300	6,837,700	36%
(152,800)	06	4,211,300	193,800	466,890	427,700	224,500	—	249,000	224,200	340,400	6,706,190	37%
136,700	07	4,348,000	205,200	208,900	567,100	349,700	—	162,000	296,900	226,100	6,697,300	35%
569,700	08	4,917,700	113,100	532,100	647,500	575,200	—	709,300	172,500	375,300	8,394,600	41%
381,000	09	5,298,700	106,600	349,900	647,800	1,624,300	—	137,200	593,800	215,900	9,311,700	43%

YCR Distribution of FY09 Funds		% of Total Funding	
Mgt., Admin., GIS	—	—	—
Enviro Quality	—	—	—
Science Comm,	1,720,800	6,700	21.0%
Natural Resources	3,209,100	305,100	65.2%
Cultural Resources	368,800	316,000	13.8%
Total:	5,298,700	647,800	100.0%

Other NPS:
 105,800 Benefits Sharing EIS
 31,400 Centennial Challenge Initiative (3 projects)
137,200

Other Federal:
 121,300 USFWS — Grizzly Conservation Strategy
 402,800 BLM, Joint Fire Sciences Program
 69,700 APHIS — Brucellosis Risk Assessment
593,800

Private:
 5,000 Archeology Donations
 12,000 Xanterra
 2,000 Montana Dept of Transportation
 196,900 Yellowstone Park Foundation
215,900

Base: 5,298,700
All other: 4,013,000
57.0%
43.0%

Not included: \$7,000 for USGS–BRD Bear Study Team (pass through only)

APPENDIX I

Personnel Roster, 2009

Professional Support Branch

Management and Administration

		YCR FTE	Non-YCR FTE
1.	Cline, Barbara	Administrative Support Assistant	1.01
2.	Gunther, Stacey	Environmental Protection Assistant	0.91
3.	Hendrix, Christie	Environmental Protection Assistant	1.01
4.	Housley, Sara	Center Clerk	0.02
5.	Lindstrom, Montana	Budget Analyst	1.00
6.	McAdam, Melissa	Sprv. Budget Analyst	1.01
7.	Olliff, Tom	Division Chief	1.02
8.	Wyman, Becky	Administrative Support Assistant	0.91
	Administrative backfill for Wyman maternity leave	—	0.11
	Maintenance & custodial assistance (Lake Research Dorm)	—	0.04
	subtotal Management & Admin:	6.89	0.15

Science Information

1.	Blackford, Tami	Editor	1.00
2.	Franke, Mary Ann	Technical Writer-Editor	0.27
3.	Schullery, Paul	Resource Naturalist	0.09
4.	Stevenson, Sarah	Technical Writer-Editor	0.07
5.	Waller, Janine	Editorial Assistant	0.99
6.	Warner, Virginia	Editorial Assistant	0.51
	subtotal Resource Information:	2.93	-

Spatial Analysis Center

1.	Bassett, Steven	Cartographic Technician	0.28
2.	Bone, Sarah	Cartographic Technician	0.21
3.	Byrne, William	Cartographic Technician	0.23
4.	Byron, Andrew	Cartographic Technician	0.25
5.	Comer, Greg	Cartographic Technician	1.00
6.	Entinger, Nicholas	Cartographic Technician	0.22
7.	Fano, Elisabeth	Cartographic Technician	0.02
8.	Guiles, Carrie	Cartographic Technician	0.97
9.	Miller, Steve	Cartographic Technician	0.98
10.	Mislivets, Maureen	Cartographic Technician	0.25
11.	Mumma, Stephanie	Cartographic Technician	0.24
12.	Rodman, Ann	Supervisor, GIS Specialist	1.06
	subtotal Spatial Analysis:	5.71	-
	Professional Support Branch:	15.53	0.15

Environmental Quality Branch**Compliance and Environmental Quality**

		YCR FTE	Non-YCR FTE
1.	Desmet, Adrienne	Office Assistant	0.46
2.	Deutch, Ann	Environmental Protection Assistant	0.43
3.	Hale, Elaine	Archeologist	0.99
4.	Klein, Bianca	Environmental Protection Specialist	0.48
5.	Madsen, Douglas	Environmental Protection Specialist	1.07
6.	Mazzu, Linda	Supervisor, Environmental Protection	1.01
7.	Mills, Sue	Environmental Protection Specialist	1.01
Environmental Quality Branch:		5.45	-

Natural Resources Branch**Natural Resources Administration**

1.	Plumb, Glenn	Chief of Natural Resources	1.00	
		Horse handler & packer support	—	0.25
subtotal NR Administration:			1.00	0.25

Wildlife Resources Team

1.	Albers, Erin	Biological Science Technician	0.99	
2.	Baril, Lisa	Biological Science Technician	0.47	
3.	Blanton, Doug	Biological Science Technician	1.01	
4.	Bramblett, Amanda	Biological Science Technician	0.40	
5.	Coleman, Tyler	Biological Science Technician	0.51	
6.	Davis, Troy	Biological Science Technician	0.56	
7.	Geremia, Chris	Biological Science Technician	1.01	
8.	Gunther, Kerry	Wildlife Biologist	1.01	
9.	Henry, Leslie	Biological Science Technician	0.36	
10.	Joest, Gerald	Biological Science Technician	0.38	
11.	Jones, Jennifer	Biological Science Technician	0.86	
12.	McIntyre, Rick	Biological Science Technician	0.51	
13.	Murphy, Kerry	Wildlife Biologist	0.84	
14.	Smith, Doug	Senior Wildlife Biologist	1.03	
15.	Stahler, Dan	Wildlife Biologist	0.66	
16.	Tallian, Aimee	Biological Science Technician	0.43	
17.	Treanor, John	Biological Science Technician	0.97	
18.	Wallen, Rick	Wildlife Biologist	1.00	
19.	White, PJ	Wildlife Biologist	1.02	
20.	Wyman, Travis	Biological Science Technician	1.03	
		Grizzly Bear Conservation Strategy monitoring	—	1.78
subtotal Wildlife:			15.05	1.78

Fisheries and Aquatic Resources

1.	Adams, Rebecca	Biological Science Technician	0.51	
2.	Arnold, Jeff	Aquatic Ecologist	1.00	
3.	Bigelow, Pat	Fisheries Biologist	1.01	

		YCR FTE	Non-YCR FTE
4.	Brodbeck, Amy	Biological Science Technician	0.24
5.	Brown, Stuart	Biological Science Technician	0.09
6.	Bunn, Jason	Biological Science Technician	0.27
7.	Bywater, Tim	Administrative Support Assistant	0.15
8.	Doepke, Phil	Biological Science Technician	0.98
9.	Dumond, Paul	Biological Science Technician	0.44
10.	Ertel, Brian	Biological Science Technician	1.01
11.	Firmage, David	Biological Science Technician	0.44
12.	Gunderman, Hannah	Biological Science Aid	0.27
13.	Kilgo, Jamie	Biological Science Technician	0.42
14.	Koel, Todd	Sprv. Fishery Biologist	1.00
15.	Ladd, Hallie	Biological Science Technician	0.32
16.	Lohmeyer, Adam	Biological Science Technician	0.43
17.	Olsen, Kate	Biological Science Technician	0.40
18.	Rupert, Derek	Biological Science Technician	0.64
19.	Skorupski, Joseph	Biological Science Technician	0.27
	Assistance to fisheries special projects	—	0.02
	subtotal Aquatic Resources:	9.89	0.02
	Natural Resources Branch:	25.94	2.05

Vegetation, Geology and Resource Management Branch

Vegetation Management

1.	Anderson, Heidi	Botanist	0.89
2.	Burson, Shan	Ecologist (Bioacoustics)	0.51
3.	Corry, Patricia	Biological Science Technician	0.40
4.	Hektner, Mary	Sprv. Vegetation Mgt Specialist	1.00
5.	Klaptosky, John	Biological Science Technician	1.08
6.	Osgood, Michelle	Biological Science Technician	0.36
7.	Pierce, Michael	Biological Science Technician	0.03
8.	Renkin, Roy	Vegetation Management Specialist	1.01
9.	Whipple, Jennifer	Botanist	0.70
	Air quality monitoring assistance	—	0.10
	Maintenance support to Gardiner Basin project	—	0.25
	subtotal Vegetation:	5.98	0.35

Resource Management Operations

1.	Barnes, Zachary	Biological Science Technician	0.30
2.	Bosserman, Heather	Biological Science Technician	0.32
3.	Cimino, Hillary	Biological Science Technician	0.39
4.	Cloghessy, Mitchell	Biological Science Aid	0.19
5.	Cloghessy, Samuel	Biological Science Technician	0.21
6.	Donovon, Mary A.	Biological Science Technician	0.31
7.	Fey, Margie	Biological Science Technician	0.31
8.	Flannery, Joseph	Biological Science Technician	0.34

		YCR FTE	Non-YCR FTE
9.	Gerot, Sharon	Biological Science Technician	0.39
10.	Haynes, James	Biological Science Technician	0.42
11.	Holdren, Anita	Biological Science Technician	0.40
12.	Kraegel, William	Biological Science Technician	0.10
13.	McAdam, Rick	Asst Resource Mgt Specialist	0.11
14.	McClure, Craig	Resource Mgt Specialist	0.76
15.	Nagashima, Vincent	Biological Science Technician	0.40
16.	Nedved, Troy	Asst Resource Mgt Specialist	0.58
17.	Overbaugh, Chris	Biological Science Technician	0.21
18.	Park, Katrina	Biological Science Technician	0.40
19.	Pazdral, Noah	Biological Science Aid	0.24
20.	Pearson, Kari	Biological Science Technician	0.29
21.	Perrotti, Patrick	Resource Mgt Specialist	1.00
22.	Reinertson, Eric	Asst Resource Mgt Specialist	0.68
23.	Reinhart, Daniel	Resource Mgt Specialist	1.03
24.	Roper, Jaime	Biological Science Technician	0.51
25.	Sechrist, George	Biological Science Technician	0.31
26.	Smith, Hilary	Biological Science Technician	0.35
27.	Teets, Brian	Biological Science Technician	0.80
	subtotal Resource Management:		11.35
Geology and Physical Sciences			
1.	Foley, Duncan	Geologist	0.08
2.	Heasler, Hank	Geologist	1.02
3.	Jaworowski, Cheryl	Geologist	0.98
4.	Mahony, Dan	Fishery Biologist	1.00
	subtotal Geology:		3.08
	Vegetation, Geology and Resource Management Branch:	20.41	0.35
Cultural Resources Branch			
1.	Conley, Molly	Museum Technician	0.21
2.	Curry, Colleen	Museum Curator	1.00
3.	Finn, Lauren	Archives Technician	0.11
4.	Guild, Bridgette	Museum Registrar	1.00
5.	Hamor, Erica	Museum Technician	0.20
6.	Johnson, Ann	Archeologist	0.26
7.	Jones, Jessica	Library Technician	0.25
8.	Krippene, Carolyn	Museum Technician	0.81
9.	Magee, Christopher	Archives Technician	0.18
10.	Murphy, Alicia	Museum Technician	0.76
11.	Pinto, Maeve	Library Technician	0.22
12.	Reid, Charissa	Cultural Anthropologist	0.31
13.	Robertson, Mariah	Archives Technician	0.72
14.	Roop, Tobin	Chief of Cultural Resources	0.05

		YCR FTE	Non-YCR FTE
15. Schiller, Samuel	Archives Technician	0.23	
16. Sucec, Rosemary	Cultural Anthropologist	0.03	
17. Washburn, Andrew	Museum Technician	0.57	
18. White, Katie	Anthropology Technician	0.54	
19. Whittlesey, Lee	Historian	1.00	
20. Zirngibl, Wendy	Museum Technician	0.01	
	Corral operations support to Archeology projects	—	0.13
	Cultural Resources Branch:	8.46	0.13
Total YCR FY09 FTE:		75.79	2.68

APPENDIX II

Publications and Reports

Professional Publications

- Almberg, E.S., L.D. Mech, D.W. Smith, J.W. Sheldon, and R.L. Crabtree. 2009. A serological survey of infectious disease in Yellowstone National Park's canid community. *PLoS ONE* 4(9):e7042.
- Anderson, T.M., B.M. vonHoldt, S.I. Candille, M. Musiani, C. Greco, D.R. Stahler, D.W. Smith, B. Padhukasahasram, E. Randi, J.A. Leonard, C.D. Bustamante, E.A. Ostrander, H. Tang, R.K. Wayne, and G.S. Barsh. 2009. Molecular and evolutionary history of melanism in North American gray wolves. *Science* 323:1339–1343.
- Baril, L.M., A.J. Hansen, R. Renkin, and R. Lawrence. 2009. Willow–bird relationships on the northern range. *Yellowstone Science* 17(3):19–26.
- Barnowe-Meyer, K.K., P.J. White, T.L. Davis, and J.A. Byers. 2009. Predator-specific mortality of pronghorn on Yellowstone's northern range. *Western North American Naturalist* 69:186–194.
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