

Lakes, Streams, and Groundwater

About five percent of the park is covered by water, including more than 220 lakes and 1,000 streams. Yellowstone Lake, which lies at an altitude of 7,730 feet, covers 136 square miles and is 400 feet deep, is the largest lake at high elevation in North America. Visitors enjoy Yellowstone's waters while sightseeing, fishing, hiking, canoeing, and motor-boating where permitted. (See "Fish and Other Aquatic Resources," page 3–28.) These recreational activities are managed so that they do not interfere with the goal of preserving wildlife in a natural setting for other visitors to enjoy. For example, the use of personal watercraft and river rafting is limited.

Yellowstone has one of the most significant unimpaired aquatic ecosystems in the United States. As a result of both natural topography and early preservation actions, the headwaters of five major river systems (Fall, Gallatin, Madison, Snake, and Yellowstone) are either in or just upstream from the park. Despite efforts earlier this century to harness some of these

rivers, the upstream portions remain free of dams and diversions and have had minimal impact from industrial pollution, road construction, mining, agriculture, or deforestation. The 670-mile Yellowstone River, the longest undammed river in the lower 48 states, plunges 308 feet at the Lower Falls in the Grand Canyon of the Yellowstone, almost twice the drop of Niagara Falls.

Below ground are reservoirs of water that feed countless hot and cold springs. This unmapped and largely unknown resource is minimally diverted for water used in the park's housing and visitor areas. Yet even these small wells and water pumping systems may affect the park's natural plumbing, and their use must be monitored. Treated wastewater that is returned into the system must meet or exceed all state and federal water quality standards.



BOATING



Non-motorized boats can be used on many park lakes, but all boating has been prohibited on the park's rivers since 1950, except for the four-mile channel between Lewis and Shoshone lakes. In 1960, the increasing use of powerboats on Yellowstone Lake prompted a proposal to ban them completely in order to protect beaches and bird nesting and to provide a sanctuary for those in search of quiet. Instead, a compromise has permitted powerboat use to continue on Lewis Lake and most of Yellowstone Lake, where many backcountry campsites can be reached only by boat or foot. Visitors can launch their own boats or charter a boat with or without a fishing guide at the Bridge Bay marina. Waterskiing and jet skiing are prohibited, and the cold Yellowstone waters generally deter all but the hardiest swimmers.

The growing popularity of kayaking and river rafting has increased pressure to open park rivers to boating. When the issue was reconsidered in the 1980s, public opinion strongly favored boating restrictions. The park's decision to retain the restrictions was based on the known ecological impacts of boats on nesting waterfowl and other wildlife, archeological and thermal resources, and bank erosion, as well as on the belief that they impair wilderness aesthetic values.

Although this has meant favoring one type of visitor use over another, it reflects the need to prevent park values from being compromised by the cumulative effects of an expanding variety of recreational activities. However, in late 1998 when American Whitewater, a national boating enthusiasts' organization, submitted a proposal to Yellowstone to allow whitewater boating on some park rivers, the park agreed to consider it.

Compared to overall park visitation, boat use has increased slowly. In 1963 the park issued 4,011 boating permits; in 1998, about 3,700 permits were issued, about 35 percent of them for motorized vessels. Commercial outfitters currently licensed to provide trips in Yellowstone include 15 for canoeing and kayaking, 6 for motorized boating, and 62 for fishing.



THREATS TO WATER QUANTITY

Through agreements reached with the state of Montana and Idaho, the NPS has sought to ensure that park ground and surface waters are sufficiently protected to maintain the natural hydrologic regimes and the landscapes that depend on them. Because state and private demands for water generally lie downstream from the park, the water quantity flowing into Yellowstone is generally not a concern. However, in the Soda Butte Creek drainage near the park's northeastern corner, upstream users claim water rights and leaching from historic mines still pollutes the water. The NPS has contracted with the U.S. Geological Survey and the Montana Bureau of Mines and Geology to describe the geohydrology of Soda Butte Creek upstream of the park boundary. This report will improve our ability to assess potential impacts to stream flow from outside groundwater development. It will provide important information, but only for the portion of the park that lies within Montana.

The potential also exists for depletion of the park's groundwater resources as a result of oil and gas or geothermal drilling outside park boundaries. (See "Geothermal Features," page 2-10.)



THREATS TO WATER QUALITY

Although the park's water resources as a whole are believed to be in excellent condition, both internal and external human activities could affect water quality and the wildlife that depends on it. Limited water quality sampling has occurred in a few of the park's remote but popular backcountry camping areas. Backcountry waters have not been surveyed for *giardia*, but water purification advice is given to backcountry users as a precaution.

Internal threats. Although the park takes steps to prevent potential pollution sources from affecting its water, continued monitoring is essential. Groundwater wells are used to monitor water

quality near the park’s sewage treatment plants at Fishing Bridge, Grant Village, Madison, and at Old Faithful, where incomplete treatment has resulted in nitrogen and chlorides being released into the groundwater (see “Energy, Utility, and Waste Management Systems,” page 7–30). Water quality could also deteriorate as a result of:

- ▣ leaking of underground petroleum storage tanks and spilling of petroleum products or other hazardous materials along roadways;
- ▣ sedimentation from erosion of unplanned social trails, stock use, and from road maintenance and construction projects;
- ▣ pollution from recreational boating and from backcountry toilets near lakeshores and streams;
- ▣ leaching from abandoned dumps;
- ▣ pollution from pesticide use; and
- ▣ deposition in snowpack from snowmobile emissions.



External threats. From 1933 to 1953, ore was intermittently processed for gold and silver extraction at the McLaren mill near Cooke City, Montana, about five miles upstream from the park’s northeast boundary. An estimated 150,000 cubic yards of mine waste containing arsenic, copper, iron, lead, and zinc have been stored on a 10-acre site on the Soda Butte Creek valley floor. In 1950, tailings from an impoundment failure were washed more than 15 miles downstream into the park, where they remain evident and toxic. Several remedial actions have been taken over the years to stabilize the impoundment; however, reduced invertebrate populations and fish with elevated tissue copper concentrations evidence continued influence and degradation of park resources. The site needs restoration to prevent continued degradation of water quality and life forms.

In the 1990s, a large gold, silver, and copper mine was proposed at the headwaters of three drainages, including Soda Butte Creek. If permitted to operate, the mine might have been a boon to the regional economy and quadrupled the population of tiny Cooke City, Montana. But the sulfuric acid which is produced when mineralized rock containing sulfur is exposed to air and water could have leached toxic

heavy metals, such as copper, lead, zinc, cadmium, and manganese, into ground and surface waters, harming aquatic life. Fortunately, the federal government agreed to trade up to \$65 million in assets to Crown Butte Mines, Inc., in exchange for the mine properties, \$22.5 million of which is held in escrow for cleanup of pollution attributed to the previous mining site. In August 1998, the New World Mine lands were formally transferred to the U.S. Forest Service.



Program Needs

- **INVENTORY AND MONITORING.** It is essential to have baseline data to determine whether any changes are occurring in water quality and quantity because of internal or external disturbances. Park maintenance staff have amassed more than 20 years of groundwater data from sewage plants in the Fishing Bridge, Grant, Madison, and Old Faithful areas. Until they closed their office in the park in 1996, the U.S. Fish and Wildlife Service (USFWS) periodically collected chemical and biological data on more than 600 streams and 100 lakes. Along with fisheries management, these responsibilities have been absorbed by park staff while base funding has



declined. Additional funding is needed to test groundwater quality and to expand chemical and biological surveys in streams and lakes, particularly in heavily-used backcountry areas, lakes with motorboat operations, and popular “hot-pots.”



- **ADDITIONAL EXPERTISE.** The park needs professional staff with training in geothermal geology, hydrology, and aquatic ecology to oversee the scientific programs required to protect Yellowstone’s physical resources. (See “Fish and Other Aquatic Resources,” page 3–28.)

- **UPGRADE INFRASTRUCTURE.** Funding is needed to replace and upgrade the infrastructure supporting developed areas. Ground and surface water contamination from park developments are likely if infrastructure is not improved. Many of the park’s sewage systems are worn out and could fail at any time, including those at Madison, Norris, Tower Falls and Old Faithful, where the treatment plant is already causing contamination problems. (See “Energy, Utility, and Waste Management Systems,” page 7–30.)



LAKES, STREAMS, AND GROUNDWATER

STEWARDSHIP GOALS



Lakes and streams are free-flowing and pristine, providing high-quality recreational opportunities for public enjoyment.

Hydrologic systems and groundwater quality and quantity are monitored and maintained at pre-settlement levels.

Human uses and facilities are monitored and have minimal impact on water quality and quantity.

Professionally trained staff oversee program to monitor, interpret, and protect ground and surface waters within and entering the park.

CURRENT STATE OF RESOURCES/PROGRAMS



Park rivers remain free-flowing and water quality in most lakes and streams is thought to be high, but monitoring is irregular. Visitors fish many waters and boat on lakes; aquatic species persist.

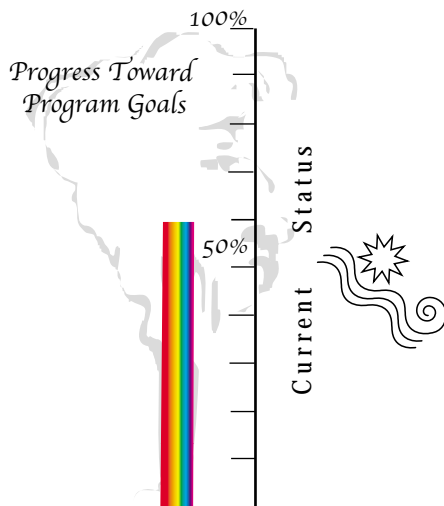
Water quantity is generally free from upstream use; proposed mines and geothermal drilling outside the park have generated interest and political support to settle specific issues, but no long-term legislative protection for hydrothermal systems.



Outdated wastewater treatment and collection systems threaten groundwater purity.



The park lacks the staff and inventory and monitoring systems needed to address internal and external threats to water quality and quantity.



1998 FUNDING AND STAFF

Recurring Funds	
Yellowstone N.P. Base Budget	\$ 14,500
Non Recurring Funds	
One-time Projects	\$ 7,600
Staff	0.4 FTE

The human resources and funding necessary to professionally and effectively manage the park to stewardship levels will be identified in the park business plan.