

Water Quality

RESOURCE BRIEF

Importance

Clean waters are vital to the diversity and health of fish and wildlife populations. All Yellowstone waters are classified as Outstanding National Resource Water, which receive the highest level of protection for surface waters under the Clean Water Act. Because of the relatively pristine nature of the park's surface waters, they are often used to establish reference conditions for the northern Rocky Mountain region. Although most of the park's watersheds originate within its boundaries and are minimally affected by human activities, they are vulnerable to impacts such as road construction, dewatering, atmospheric deposition, sewage spills, climate change, and runoff from mining sites outside park boundaries, all of which can have cascading effects on aquatic and terrestrial communities. Sections of the Soda Butte and Reese creeks are listed as "impaired" by the state of Montana.

Status in Yellowstone National Park

The characteristics of Yellowstone's surface waters are influenced primarily by season, elevation, and precipitation. Some waters are also affected by the park's geothermal features, generally resulting in warmer temperatures and higher dissolved ion concentrations. Water temperature, dissolved oxygen, pH, specific conductance, turbidity, and total suspended solids are monitored monthly at 11 stream and 7 lake sites. Chemical parameters are collected from 10 stream sites, including anions (sulfate, chloride, bicarbonate and carbonate), cations (calcium, magnesium, sodium, and potassium), and nutrients (total phosphorus, orthophosphate, nitrate, nitrite, and ammonia).

In 2008, 6 of the 11 monitored stream sites did not meet EPA and/or state standards for pH, turbidity, or temperature in at least one monthly sampling. However, most of these exceedances are likely the result of natural rather than anthropogenic factors. Many stream sites have upstream thermal inputs that affect pH and water temperature. Analysis of water quality data is underway to better understand the natural variation of Yellowstone's surface waters and increase our ability to detect changes caused by anthropogenic sources.

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



NPS/JEFF ARNOLD

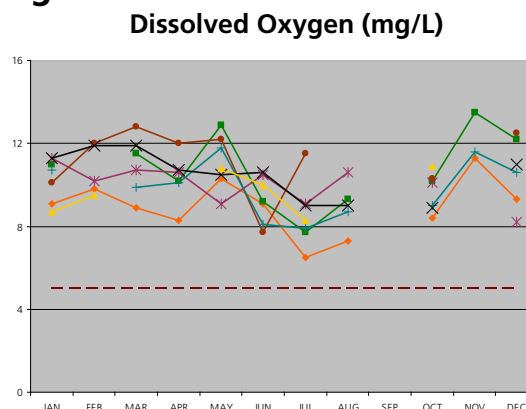
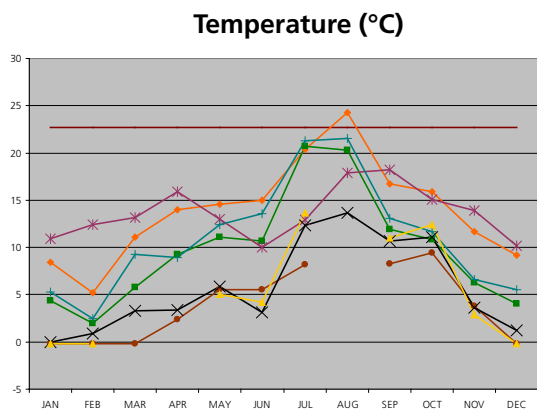
NPS water quality technicians measure the temperature, dissolved oxygen concentration, and specific conductance of the Gardner River as a part of the Vital Signs Monitoring Program.

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. The site at Soda Butte Creek, which is not a Class 1 water, exceeded EPA and state standards for dissolved iron when a water sample collected in September 2008 was tested. State and federal agencies are participating in a long-term plan to remove the mine tailings from the streambed. In 2009 park staff will increase water sampling at the creek to better monitor possible impacts of the removal process.

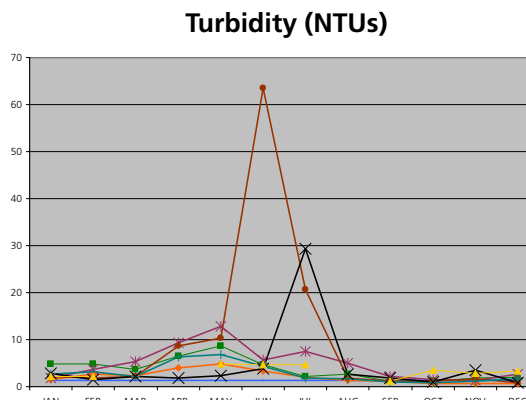
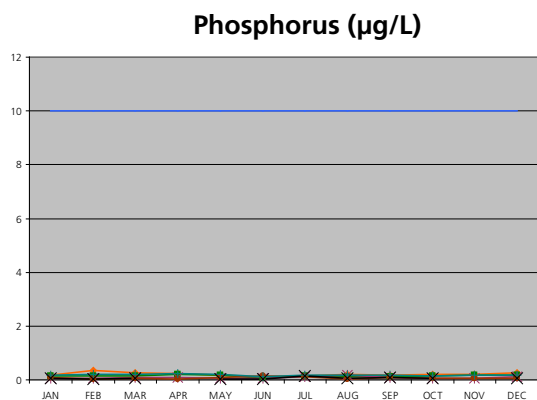
Discussion

Yellowstone's long-term water quality monitoring program was initiated in 2002 by park staff, the National Park Service (NPS) Inventory and Monitoring Program, and the NPS Water Resources Division. In June 2006, monitoring was expanded to include anions, cations, and nutrients. Although nutrient concentrations may provide evidence of human impacts, they remain relatively low in the park and are not a cause for concern. Long-term monitoring data is shared annually for archiving and distribution using the Environmental Protection Agency's STORET system.

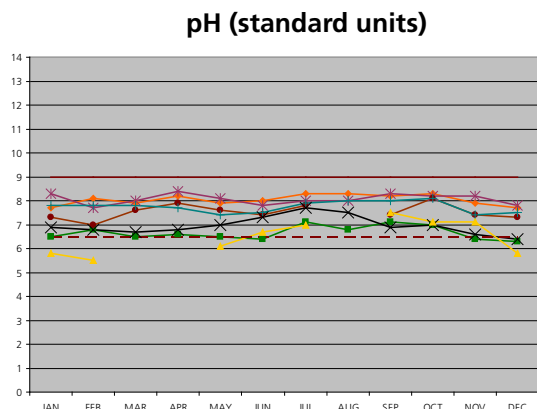
2008 Monitoring Data



Fish have adapted to the geothermally influenced temperatures in rivers such as the Firehole, Gibbon, and Madison, but trout mortality is generally high in water that exceeds 68°F (20°C). When stream flows decline below long-term averages and/or stream temperatures approach 73°F (22.7°C) for three days, as has occurred in some streams in recent summers, the park may impose angling restrictions to prevent additional stress on the fish. Although colder water holds more oxygen, dissolved oxygen levels in the park have remained above the level that sustains aquatic life.



Although phosphorus is essential for aquatic plant growth, even a small increase may indicate anthropogenic input such as sewage spills or runoff from road surfaces. For Western Forested Mountain areas, the EPA has recommended limits of 10 micrograms per liter for total phosphorus (dissolved and suspended) and 1.3 NTUs for turbidity (a measure of water clarity). Yellowstone waters frequently exceed 1.3 NTUs because of naturally caused runoff. (Note high turbidity during spring runoff and August monsoon season.)



Rivers

- ▲— Firehole
- ×— Gibbon
- *— Gardner
- Lamar
- Madison
- Soda Butte (lower)
- ▼— Yellowstone (Canyon)

Monitoring Thresholds

- Maximum
- - - Minimum
- EPA proposed maximum

The EPA has determined that pH levels from 6.5 to 9.0 are optimum for freshwater aquatic life. Yellowstone waters are sometimes more acidic, especially the Gibbon River, because of geothermal influences.

