



Climate Change at Big Hole National Battlefield

The event that Big Hole National Battlefield commemorates as a park originated in its natural environment. The Nez Perce camped in this area because of its water, fertile soil, vegetation, and wildlife long before they resisted relocation in 1877. By 1933, when BIHO became part of the National Park Service, what the war had left behind—the bullet-scarred trees, the willows, grasses, camas, and other traditional food plants—had been altered by natural succession in the absence of fire, livestock grazing, and the arrival of nonnative plants. Now the consequences of climate change are complicating the goal of maintaining the site to resemble conditions as they were in 1877.

Climate Trends

Even in the Big Hole Valley's relatively cold climate, a slight increase in temperature could have a large effect on the environment. The average number of days per year that temperatures in western Montana reach at least 90°F has risen from 5 to 15 during the last century, and the average number of days when the temperature remains above freezing has increased by about 16. This results in less snowpack, faster evaporation, reduced runoff to streams, and a longer growing season. Some species may adapt to these conditions and some may thrive, but others will not. Although no simple solutions are available to halt these changes, monitoring BIHO's resources so that we can learn from them is more important than ever.

Aquatic Habitats

Lower streamflow in BIHO as a result of reduced snowpack and higher temperatures could lower the groundwater tables that sustain willow and other riparian species which shade streams during the summer. Flooding during spring runoff replenishes nutrients in the adjacent meadow that supports camas. Reduced ice cover and warmer water may also promote the spread of invasive aquatic plants and animals. The only river-dwelling arctic grayling left in the lower 48 states are in the Big Hole River watershed, where their population has been reduced by the irrigation system and use of streamside land for livestock. The grayling, which evolved to survive long, cold winters, could lose out to introduced nonnative trout in warmer water.



Arctic grayling (*Thymallus arcticus*)



The nonnative spotted knapweed and native spotted frog.

Amphibians

Like other amphibians, the two species that have been found in BIHO—the Columbia spotted frog (*Rana luteiventris*) and the western toad (*Bufo boreas*)—require wetlands for part of their life cycle. Whether caused by warmer temperatures or reduced precipitation, shallower water exposes amphibian embryos to more extremes in temperature and increases the possibility the water may evaporate before metamorphosis occurs. The Big Hole River's oxbows and meanders through the park provide relatively unimpaired habitat for these increasingly rare species, and monitoring of stream and riparian conditions will help the Park Service track changes in them over time.

Invasive Plants

Some of the grasses and other leafy plants in BIHO are not native to the area; they arrived in the park uninvited or as a result of agricultural use. Climate change is expected to further the spread of invasive species, which often have traits such as wide temperature tolerance and resilient means of dispersal that help them adapt to changing conditions and outcompete native plants. In BIHO, park staff are trying to eliminate the most aggressive non-native plants, such as spotted knapweed (*Centaurea stoebe*).

Conifers

Although bark beetles are native to western pine forests, infestations such as those occurring in BIHO and throughout much of Montana are causing the most widespread tree mortality in recorded history. Evidence suggests that warming temperatures have intensified outbreaks of mountain pine beetle (*Dendroctonus ponderosae*) by enabling the beetles to survive the winter even at higher elevations. Earlier snowmelt and warmer temperatures also make many tree species more vulnerable to attack by beetles and more vulnerable to wildfire.

For More Information

Upper Columbia Basin Inventory and Monitoring Network
<http://science.nature.nps.gov/im/units/ucbn/>