

Vegetation

Much of Yellowstone's beauty comes from the tapestry of color draped across its mountains and valleys—the yellowish green, dark green, and darker bluish-green of young lodgepole pine, spruce, subalpine fir, and Douglas-fir that stand in contrast to the gray of alpine ridges, the rich bright green of meadows, an occasional splash of autumn yellow from aspen, and the browns and blacks of burned forest. These different plant communities provide food and homes for animals that range from insects to grizzly bears. An animal's presence is often a direct result of the plant species growing in the area.

About 80 percent of the park is covered by forests, with lodgepole pine usually dominating. Meadows constitute an additional 15 percent of the vegetation cover. The most extensive non-forested areas are in the lower elevations in the north, which serves as part of the winter range for elk, bison, and other ungulates. Detailed park vegetation maps are available for scientists' and managers' use.

The unique plant communities in geothermal areas reflect the varying chemistry and heat regimes in these remarkable habitats. Ross's bentgrass, found in the geyser basins along the Firehole River, and Yellowstone sand verbena, which grows along the shore of Yellowstone Lake, have been found nowhere else in the world.

PLANT PESTS AND EXOTIC INVADERS

In recent decades, the greatest human influence on the park's vegetation has been the introduction of at least 170 exotic species. Since most people cannot distinguish them from native plants, the exotic plant problem in the park is largely invisible to visitors. Not all of these non-native plants pose a significant known threat to native species, but many, such as common timothy and Kentucky bluegrass, are highly invasive and can substantially alter native plant and associated animal communities in ways we do not yet completely understand.

LEAST WANTED WEEDS

Yellowstone cooperates with surrounding states, counties, and other federal agencies in efforts to control non-native plants, including species considered noxious because they may replace native diversity with monocultures that are unpalatable to both livestock and wildlife. Control efforts may include the use of biological controls, such as insects that feed on the unwanted plants, and genetically altered material to control non-native invaders.

A top priority on western rangelands is restraining the widespread knapweeds that can displace virtually all other species in an area. The four species of knapweed that are found in the park are priorities for control action. Herbicides are fairly effective against knapweed but can be cost-prohibitive because of the seeds' ability to remain dormant for up to 10 years. This requires annual reapplication of chemicals, which must be carefully chosen and applied to minimize adverse effects on non-target species, waters, and soils.

With so many invader species, the park must be realistic and target those that most threaten native resources and for which control is likely to be successful.





ENVIRONMENTAL INFLUENCES

Yellowstone straddles the Continental Divide halfway between the equator and the north pole. Most of the park lies between 7,000 and 9,000 feet, in a subalpine zone. The timberline appears at about 10,000 feet, and many peaks extend higher. Its climate is characterized by long cold winters and short cool summers. Frost and snowfall can occur anytime of the year at the higher elevations. The mean monthly temperature at Yellowstone Lake ranges from 10.7° F to 55.2° F during the year and averages 32.8° F.

Although the southwest corner receives about 70 inches of precipitation a year, most of the park receives between 30 and 50 inches, depending on elevation; the northern portion is semi-arid, receiving 13 to 15 inches a year. Nearly half of the year's total precipitation lies in the snowpack on the first of April and is released into the soil and surface waters over the next three months. Rainfall is usually insufficient to replace water that evaporates or is drawn from the soil by plants, causing soils to dry out during the summer. In years of low winter precipitation, drought conditions usually prevail. These factors greatly influence which plants can grow in the park.

Although the full extent of exotic plant infestations in the park is not known, they are heavily concentrated along roads, trails, and in developed areas. Ground-disturbing activities tend to promote the establishment of exotic vegetation that can eventually spread to backcountry areas. The seeds of exotic plants become lodged in the crevices of cars, trucks, or construction equipment and fall out as vehicles travel through the park. They also arrive in infested hay used to feed stock, in sand and gravel used for road projects, or in the mud on someone's shoes. Seeds can pass through an animal's digestive system and be deposited miles from the nearest road.

Although elimination of all exotic plants is not feasible, the park has developed a program to identify the species that pose the most serious threats and to focus on areas that offer the best prospects for successful control efforts. The program emphasizes the education of park staff and visitors, prevention of exotic plant establishment, and plant control by hand-pulling, mowing, and the application of approved herbicides. The Federal Lands Highway Program, which has disturbed hundreds of acres during park road reconstruction, has been a major source of funding to control exotic plants.

In 1998, more than 140 park staff and 100 volunteers assisted with some aspect of exotic plant control, treating 33 different species on more than 2,000 acres of land. To learn more about the ecology and effects of exotic plant infestations, park staff are monitoring 57 long-term study plots along roadsides, and a mapping project involving 12 federal, state, and county agencies has been carried out to help managers assess the threats to Yellowstone from uncontrolled weeds on adjacent lands.

Efforts to control some invaders, such as Dyer's woad, have been effective primarily due to early recognition and eradication. Other species, such as Dalmatian toadflax, escaped well before their effects on native plant communities were recognized. Because of the magnitude of the threat posed by so many non-native species with different life histories, more research is needed to determine the long-term efficacy of control efforts on many species. A plan to prioritize and attack weed invaders has lacked funding for full-scale implementation.

Although attempts to control epidemic levels of tree-killing insects and diseases were made until the late 1960s, native pests, such as pine beetles, are now recognized as a natural part of the ecosystem. Yet the threat posed by introduced blister rust fungus to limber and whitebark pine trees, which are fairly limited in their distribution, is a source of renewed concern (see "Inventory and Monitoring," page 5–9). Whitebark pine nuts are an important fall food source for wildlife such as red squirrels, Clark's nutcrackers, and grizzly bears.

REVEGETATION

The park contains about 50 miles of abandoned roads and bridges, and more than 4,000 acres of obsolete debris dumps, gravel pits, decked log piles, construction camps, visitor use facilities, and sewer systems that were left behind when old facilities were closed. Aside from being unsightly, these sites pose safety concerns and create an ongoing disturbance to natural processes. Some abandoned dumps may contain hazardous substances, such as PCBs, that could affect surface and ground water sources and aquatic life. Erosion from gravel pits and quarries has resulted in sedimentation of adjacent creeks and, in some cases, impedes trout spawning runs. Vegetation has been disturbed by slope erosion from road cuts, by illegal or careless off-road travel and parking, and by motorized vehicles that are necessary to service telephone and power lines.

A portion of the northern winter range known as the Boundary Lands Area, which was acquired by the park in the 1930s, shows substantial effects of early homesteads, irrigation, cattle grazing, hay production, and gravel mining. Little progress has been made in restoring natural contours or in reestablishing the native plant species in the area.

Many disturbed areas of the park have been left to revegetate naturally, with limited success. The vegetation is stunted or sparse because of soil compaction or poor growing conditions, and native plants are sometimes displaced by exotic species. Some of the disturbed sites may be of historic interest and must be professionally evaluated to determine what type of cleanup or site rehabilitation is appropriate. Cooperative efforts, such as that done with Montana to restore the site of a small abandoned coal mine on McMinn



Bench, have been cost-effective and popular with state and federal partners. (See “Restoration of Mining Sites,” page 2–10.) In the 1980s, the park’s landscape architects established a native seed bank and nursery stock for use in revegetating disturbed sites, which costs on average \$1,200 per acre.

RARE PLANTS, WETLANDS, AND RIPARIAN ZONES

Among the plants of special concern that have been listed by the Natural Heritage Programs of the surrounding states are about 100 species known to occur in the park. Two of these species are endemic to the park: Yellowstone sand verbena (*Abronia ammophila*) and Ross’ bentgrass (*Agrostis rossiae*). Information on the presence and status of these rare native species and other plants is needed to protect them from impacts in popular visitor use areas and construction projects within the park and on lands outside park boundaries.

Wetlands are being documented and mapped within a 400-foot wide corridor along the Grand Loop road as part of the resource inventories needed for road reconstruction, and the U.S. Fish and Wildlife Service has prepared National Wetland Inventory maps on a 1:24,000 scale. However, little is known about wetlands outside the road corridor.

Riparian corridors have been a subject of little research and much debate. When a major research initiative on the northern range was launched in the 1980s, it focussed on elk and grassland dynamics because of funding limitations. A series of studies is needed to investigate the relationships among elk, moose, beaver, and the landscape’s woody vegetation—aspens, cottonwoods, and willow.



Program Needs

- **INVENTORY AND MONITORING.** In recent years, increased surveys for endemic species have been made possible by funding from Canon, U.S.A., Inc., secured through the National Park Foundation. However, the park needs to establish a viable program to systematically inventory and monitor plant resources, with a special emphasis on undisturbed areas, wetlands, and the less conspicuous plants such as fungi, mosses, liverworts, and lichens.

- **STAFFING.** The park employs a vegetation management specialist and, for part of the year, a botanist who also serves as curator of the herbarium. Much of their time must be devoted to special projects such as road reconstruction surveys and consultation. The park would greatly benefit from additional staff to assist with plant surveys, monitoring, and management activities such as “hazard tree” removal. Yellowstone’s conifers tend to be shallow-rooted and therefore prone to falling or being blown down on to roads, buildings, trails, and campsites. Specially trained staff are needed to identify and remove high-risk trees from visitor use and developed areas. Additional staff could also develop a cyclic revegetation program, collecting and generating plant cuttings, seeds, and trees for use in landscaping and replanting projects in park picnic areas, campgrounds, roadsides, and historically disturbed areas.

- **CONTROLLING INVASIVE PLANTS.** More funding is needed to monitor and control non-native plants that threaten native species. The success of control efforts should be regularly evaluated so that the results can be used to determine the most effective strategies.



- **RESEARCH.** Further research is needed to answer site-specific questions such as whether mountain goats influence high-elevation native plant communities and how wildlife use affects thermal areas. We also need to improve our understanding of the ecology of riparian and woody plants, and how and where exotic vegetation is most likely to spread.





VEGETATION

STEWARDSHIP GOALS



Professionally trained experts oversee programs to inventory, monitor, protect, and interpret native plant species and communities.



Botanists survey, map, and protect wetlands and rare and sensitive plants and habitats parkwide.



Non-native species and other threats to native plant communities are addressed through integrated pest management programs.



Staff maintain a program of native species landscaping and revegetation in areas of human-caused disturbance.



Visitor safety and scenic vistas in high-use areas are enhanced where necessary through vegetation management.

CURRENT STATE OF RESOURCES/PROGRAMS



A small professional staff oversees vegetation management and catalogues plants in the park herbarium; natural processes such as fire, floods, and native ungulate grazing occur largely unimpeded by humans—with controversial results.



Park vegetation, habitat and cover types, and wetlands are mapped and available in GIS format. Some rare plant surveys have been done, but limited resources are devoted to studying riparian plant communities or rare habitats.



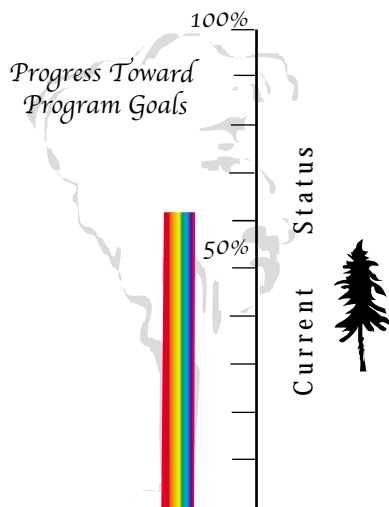
Exotic plant infestations increase, presently outstripping our ability to study and control effects on native plant and animal communities.



Cooperative partnerships have resulted in a native plant propagation program used for revegetation of construction sites.



Hazard trees are removed as time and staffing allow, but a more comprehensive management program is warranted for safety in high-use areas.



1998 FUNDING AND STAFF

Recurring Funds	
Yellowstone N.P. Base Budget	\$ 76,500
Non-Recurring Funds	
One-time Projects	\$ 76,550
Staff	3.4 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.