Chapter 10: Sustaining Biodiversity: Saving Ecosystems and Ecosystem Services Establishing Parks and Other Nature Reserves
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Establishing Parks and Other Nature Reserves

According to the IUCN, there are more than 6,600 major national parks located in more than 120 countries (see chapter-opening photo). These are areas where people can enjoy and interact with nature under certain restrictions.

However, most of these parks are too small to sustain many large animal species. In addition, most of them receive little protection and are often called "paper parks." Many parks also suffer from invasions by harmful nonnative species that can outcompete and reduce the populations of native species. Some national parks are so popular that large numbers of visitors are degrading the natural features that make them attractive (see the Case Study that follows).

Case Study

Stresses on U.S. Public Parks

The U.S. National Park System, established in 1912, includes 59 major national parks, sometimes called the country's crown jewels that are owned jointly by all U.S. citizens (see chapter-opening photo). The U.S. national park system also has 339 monuments, recreational areas, battlefields, historic sites, and other areas. States, counties, and cities also operate public parks.

In 1872 Congress set aside public land for Yellowstone National Park—the world's first national park. Historian, conservationist, and writer Wallace Stegner called it "the best idea America ever had."

Popularity threatens many parks. Between 1960 and 2014, the number of recreational visitors to U.S. national parks more than tripled, reaching about 293 million. In order, the three most visited places in the National Park System in 2014 were the Golden Gate National Recreation Area, the Blue Ridge Parkway, and the Great Smoky Mountain National Park.

In some U.S. parks and other public lands, dirt bikes, dune buggies, jet skis, snowmobiles, and other off-road vehicles destroy or damage vegetation, disturb wildlife, and negatively affect the park experience for many visitors. Some visitors expect parks to have grocery stores, laundries, bars, and other such conveniences. Cell phone towers now degrade the pristine nature of some parks.

A number of parks also suffer damage from the migration or deliberate introduction of nonnative species. European wild boars (see Figure 9.11), imported into the state of North Carolina in 1912 for hunting, threaten vegetation in parts of the popular

Great Smoky Mountains National Park. Nonnative mountain goats in Washington State's Olympic National Park trample and destroy the root systems of native vegetation and accelerate soil erosion.

Native species—some of them threatened or endangered—are killed in, or illegally removed from, almost half of all U.S. national parks. However, the endangered gray wolf was successfully reintroduced into Yellowstone National Park after a 50-year absence (Science Focus 10.4).

Science Focus 10.4

Reintroducing the Gray Wolf to Yellowstone National Park

In the 1800s, at least 350,000 gray wolves (Figure 10.B) roamed over 75% of America's lower 48 states—especially in the West. The wolves preyed on bison, elk, caribou, and deer. Between 1850 and 1900, most of them were shot, trapped, or poisoned by ranchers, hunters, and government employees. This drove the gray wolf to near extinction in the lower 48 states.

Figure 10.B

After becoming almost extinct in much of the western United States, the *gray wolf* was listed and protected as an endangered species in 1974.

Volodymyr Burdiak/ Shutterstock.com

Ecologists recognize the important role that this keystone predator species once played in the Yellowstone National Park region. The wolves culled herds of bison, elk, moose, and mule deer, and kept down coyote populations. By leaving some of their kills partially uneaten, they provided meat for scavengers such as ravens, bald eagles, ermines, grizzly bears, and foxes.

When the number of gray wolves declined, herds of plant-browsing elk, moose, and mule deer expanded and overbrowsed the willow and aspen trees growing near streams and rivers. This led to increased soil erosion and declining populations of other wildlife species such as beaver, which eat willow and aspen. This in turn affected species that depend on wetlands created by dam-building beavers.

In 1974 the gray wolf was listed as an endangered species in the lower 48 states. In 1987 the U.S. Fish and Wildlife Service (USFWS) proposed reintroducing gray wolves into Yellowstone National Park to try to help stabilize the ecosystem. The proposal brought angry protests from ranchers who feared the wolves would leave the park and attack large numbers of their cattle and sheep and from hunters who feared the wolves would kill too many big-game animals. Mining and logging companies objected, fearing that the government would halt their operations on wolf-populated federal lands.

Federal wildlife officials caught gray wolves in Canada and northwest Montana and in 1996 relocated 41 of them in Yellowstone National Park. Scientists estimate that the long-term carrying capacity of the park is 110 to 150 gray wolves. As of December 2014, the park had 104 wolves in 11 packs.

The reintroduction of this keystone species has turned the park into a living ecological laboratory. Wildlife ecologist Robert Crabtree and other scientists have been using radio collars to track some of the wolves and are studying the ecological effects of reintroducing the wolves. Their research indicates that the return of this keystone predator has decreased populations of elk, the wolves' primary food source. The leftovers of elk killed by wolves have also been an important food source for scavengers such as bald eagles and ravens.

The wolves' presence, with a projected decline in elk numbers, was supposed to promote the regrowth of young aspen trees that elk feed on and had depleted. However, a study led by U.S. Geological Survey scientist Matthew Kauffman indicated that the aspen were not recovering despite a 60% decline in elk numbers. Declining populations of elk were also supposed to allow for the return of willow trees along streams. Research indicates that willows have only partly recovered.

The wolves have cut in half the Yellowstone population of coyotes—the top predators in the absence of wolves. This has reduced coyote attacks on cattle from area ranches and has led to larger populations of small animals such as

ground squirrels, mice, and gophers, which are hunted by coyotes, eagles, and hawks.

Overall, this experiment has had some important ecological benefits for the Yellowstone ecosystem, but more research is needed. The focus has been on the gray wolf, but other factors such as drought and the rise of populations of bears and cougars may play a role in the observed ecological changes and need to be examined. Some scientists hypothesize that the long-term absence of wolves led to a number of changes in plant and animal numbers and diversity that are difficult to reverse.

The wolf reintroduction has also produced economic benefits for the region. One of the main attractions of the park for many visitors is the hope of spotting wolves chasing their prey across its vast meadows.

Critical Thinking

If the gray wolf population in the park were to reach its estimated carrying capacity of 110 to 150 wolves, would you support a program to kill wolves to maintain this population level? Explain. Can you think of other alternatives?

Many U.S. national parks have become threatened islands of biodiversity surrounded by commercial development. Their wildlife and recreational value are threatened by nearby activities such as mining, logging, livestock grazing, coal-fired power plants, and urban development. The National Park Service reports that air pollution, mainly from coal-fired power plants and dense vehicle traffic, impairs scenic views more than 90% of the time in many U.S. national parks.

The National Park Service estimated that in 2014, the national parks had at least an $11.5 billion backlog for long overdue maintenance and repairs to trails, buildings, and other park facilities. Some analysts say that some of the funds needed for such purposes could come from private concessionaires who provide campgrounds, restaurants, hotels, and other services for park visitors. They pay the government franchise fees averaging only about 6–7% of their gross receipts, and many large concessionaires with long-term contracts pay as little as 0.75%. Analysts say these percentages could reasonably be increased to around 20%.

Since the 1930s, there have been efforts to sell U.S. National Parks and other public lands to private owners and developers. These pressures are increasing, as discussed in Chapter 25.

Parks in less-developed countries have the greatest biodiversity of all the world's parks, but only about 1% of these parklands are protected. Local people in many of these countries enter the parks illegally in search of wood, game animals, and other natural products that

they need for their daily survival. Loggers and miners also operate illegally in many of these parks, as do wildlife poachers who kill animals to obtain and sell items such as rhino horns (see Figure 9.16), elephant tusks, and furs. Park services in most of the less-developed countries have too little money and too few personnel to fight these invasions, either by force or through education.