Yellowstone National Park has abundant and diverse wildlife. A wolf chases ravens and magpies from an elk carcass killed by the Slough Creek wolf pack near the Lamar River.

Wildlife

Yellowstone's abundant and diverse wildlife are as famous as its geysers. Habitat preferences and seasonal cycles of movement determine, in a general sense, where a particular animal may be at a particular time. Early morning and evening hours are when animals tend to be feeding and are more easily seen. But remember that the numbers and variety of animals you see are largely a matter of luck and coincidence.

Wild animals, especially females with young, are unpredictable and dangerous. Keep a safe distance from all wildlife. Each year a number of park visitors are injured by wildlife when approaching too closely. Approaching on foot within 100 yards (91 m) of bears or wolves, or within 25 yards (23 m) of other wildlife is prohibited. Please use roadside pullouts when viewing wildlife. Use binoculars or telephoto lenses for safe viewing and to avoid disturbing wildlife.

By being sensitive to its needs, you will see more of an animal's natural behavior and activity. If you cause an animal to move, you are too close. It is illegal to willfully remain near or approach wildlife, including birds, within any distance that disturbs or displaces the animal.

FREQUENTLY ASKED QUESTION:

Where can I see wildlife?

It helps to know the habits and migration patterns of the animals you want to see and the habitats in which they live. For example, bighorn sheep are adapted to live on steep terrain, so you might see them on cliffs in the Tower area. Osprey eat fish, so you would expect to see them along rivers. Bison graze on grasses and sedges, and mate in August, so you are likely to see them in big, noisy herds in the Hayden and Lamar valleys.

Hydrothermal basins provide important habitat for wildlife. For example, some bison live in the Old Faithful area year-round. In the winter, they take advantage of the warm ground and thin snow cover. Both black and grizzly bears visit these areas during the spring when winter-killed animals are available. Rangers at the visitor centers can tell you where wildlife have been seen recently.

Yellowstone is home to the largest concentration of mammals in the lower 48 states. Here, bison, pronghorn, and elk (in the far distance) graze on the northern range.

Mammals

Yellowstone is home to the largest concentration of mammals in the lower 48 states. In addition to having a diversity of small animals, Yellowstone is notable for its predator–prey complex of large mammals, including eight ungulate species (bighorn sheep, bison, elk, moose, mountain goats, mule deer, pronghorn, and white-tailed deer) and seven large predators (black bears, Canada lynx, coyotes, grizzly bears, mountain lions, wolverines, and wolves).

The National Park Service's goal is to maintain the ecological processes that sustain these mammals and their habitats while monitoring the changes taking place in their populations. Seasonal or migratory movements take many species across the park boundary where they are subject to different management policies and uses of land by humans.

Understanding the links between climate change and these drivers will be critical to informing the ecology and management of Yellowstone's wildlife in the years to come.

Quick Facts

Yellowstone is home to the largest concentration of mammals in the lower 48 states.

- 67 different mammals live here, including many small mammals.
- Approximately 1,050 grizzly bears live in the Greater Yellowstone Ecosystem.
- Black bears are common.
- Gray wolves were restored in 1995. As of January 2026, at least 84 live primarily in the park.
- Wolverine and lynx, which require large expanses of undisturbed habitat, live here.
- Seven native ungulate species—elk, mule deer, bison, moose, bighorn sheep, pronghorn, and white-tailed deer—live here.
- As of August 2025, there were approximately 5,300 bison.
- Nonnative mountain goats have colonized northern portions of the park.

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Bears

Yellowstone is home to two species of bears: grizzly bears and black bears. The Greater Yellowstone Ecosystem is one of few areas south of Canada where these two bear species coexist. Grizzly bears are more aggressive than black bears and more likely to rely on their size and aggressiveness to protect themselves and their cubs from predators and other perceived threats. Their evolution diverged from a common ancestor more than 3.5 million years ago, but their habitats only began to overlap about 13,000 years ago.

People who visited Yellowstone prior to the 1970s often remember seeing bears along roadsides and within developed areas of the park. Although observing these animals was very popular with park visitors, it was not good for people or bears. In 1970, the park initiated an intensive bear management program to return the grizzly and black bears to feeding on natural food sources and to reduce bear-caused human injuries and property damage. The measures included installing bear-proof garbage cans and closing garbage dumps in the park.

Visitors should be aware that all bears are potentially dangerous. Park regulations require that people stay at least 100 yards (91 meters) from bears (unless safely in your car as a bear moves by). Bears need your concern, not your food; it is against the law to feed any park wildlife, including bears. All

Yellowstone is home to both grizzly bears (above) and black bears. Safe traveling in bear country begins before you get on the trail.

of Yellowstone is bear habitat – from the deepest backcountry to the boardwalks around Old Faithful. Prepare for bear encounters no matter where you go by learning more about bear safety.

Grizzly Bears

Compared to black bears, grizzly bears have a much smaller range across the United States. The grizzly bear is typically larger than the black bear and has a large muscle mass above its shoulders; a concave, rather than straight or convex, facial profile; and much more aggressive behavior. The grizzly bear is a subspecies of brown bear that once roamed large swaths of the mountains and prairies of the American West. Today, the grizzly bear remains in a

Grizzly Bears

Number in Yellowstone
Approximately 150–200 with home ranges wholly or partially in the park.

Approximately 1,050 estimated in greater Yellowstone.

Where to See
Dawn and dusk in the Hayden and Lamar valleys, on the north slopes of Mt. Washburn, and from Fishing Bridge to the East Entrance.

Size and Behavior

- Males weigh 200–700 pounds, females weigh 200–400 pounds; adults stand about 3½ feet at the shoulder.
- May live 15–30 years.
- Grizzly bears are generally 1½ to 2 times larger than black bears of the same sex and age class within the same geographic region, and they have longer, more curved claws.
- Lifetime home range: male, 800–2,000 square miles, female, 300–550 square miles.
- Agile; can run up to 40 mph.
- Can climb trees, but curved claws and weight make this difficult.
- Adapted to life in forest and meadows.
- Food includes rodents, insects, elk calves, cutthroat trout, roots, pine nuts, grasses, forbes, and large mammals.
- Mate in spring, but implantation of embryos is delayed until fall; gives birth in the winter to 1–3 cubs.
- Considered super hibernators.

Status

- Currently listed as a Threatened Species under the Endangered Species Act.
- Scientists and managers believe the grizzly population is doing well. Grizzlies are raising cubs in nearly all portions of the greater Yellowstone area and dispersing into new habitat. Currently, they occupy 27,066 square miles in the Greater Yellowstone Ecosystem.
- The states of Wyoming, Montana, and Idaho have all petitioned the US Fish and Wildlife Service to consider removing GYE grizzlies from Threatened Species status.

few isolated locations in the lower 48 states, including Yellowstone. In coastal Alaska and Eurasia, the grizzly bear is known as the brown bear.

The Greater Yellowstone Ecosystem and northwest Montana are the only areas south of Canada that still have large grizzly bear (*Ursus arctos horribilis*) populations. Grizzly bears were federally listed in the lower 48 states as a threatened species in 1975 due to unsustainable levels of human-caused mortality, habitat loss, and significant habitat alteration. Grizzly bears may range over hundreds of square miles, and the potential for conflicts with human activities, especially when human food is present, makes the presence of a viable grizzly population a continuing challenge for its human neighbors in the Greater Yellowstone Ecosystem.

Population

The estimated Greater Yellowstone Ecosystem grizzly bear population increased from 136 in 1975 to a peak of 1,050 in 2025. The bears have gradually expanded their occupied habitat by more than 50%. As monitored by the Interagency Grizzly Bear Study Team, the criteria used to determine whether the population within the Greater Yellowstone Ecosystem has recovered include estimated population size, distribution of females with cubs, and mortality rates.

FREQUENTLY ASKED QUESTIONS:

Where are the bears?

People who visited Yellowstone prior to the 1970s often remember seeing bears along roadsides and within developed areas of the park. Although observing these bears was very popular with park visitors, it was not good for people or bears. In 1970, the park initiated an intensive bear management program to return the grizzly and black bears to feeding on natural food sources and to reduce bear-caused human injuries and property damage. The measures included installing bear-proof garbage cans and closing garbage dumps in the park.

Bears are still seen near roads and they may be seen occasionally in the wild. Grizzly bears are active primarily at dawn, dusk, and night. In spring, they may be seen around Yellowstone Lake, Fishing Bridge, Hayden and Lamar valleys, Swan Lake Flat, and the East Entrance. In mid-summer, they are most commonly seen in the meadows between Tower–Roosevelt and Canyon, and in the Hayden and Lamar valleys. Black bears are most active at dawn and dusk, and sometimes during the middle of the day. Look for black bears in open spaces within or near forested areas. Black bears are most commonly observed between Mammoth, Tower, and the Northeast Entrance.

Are grizzly bears considered threatened or endangered?

The Yellowstone grizzly population is listed as a federal Threatened Species as of a court decision on September 24, 2018. Regardless of its listing status, scientists will continue to monitor the long-term recovery goals for grizzly bears.

Description

The grizzly bear's color varies from blond to black, often with pale-tipped guard hairs. In the Greater Yellowstone Ecosystem, many grizzly bears have a light-brown girth band. However, the coloration of black and grizzly bears is so variable that it is not a reliable means of distinguishing the two species.

Bears are generally solitary, although they may tolerate other bears when food is plentiful. Grizzlies have a social hierarchy in which adult male bears dominate the best habitats and food sources, generally followed by mature females with cubs, then by other single adult bears. Subadult bears, who are just learning to live on their own away from mother's protection, are most likely to be living in poor-quality habitat or in areas nearer roads and developments. Thus, young adult bears are most vulnerable to danger from humans and other bears, and to being conditioned to human foods. Food-conditioned bears are removed from the wild population.

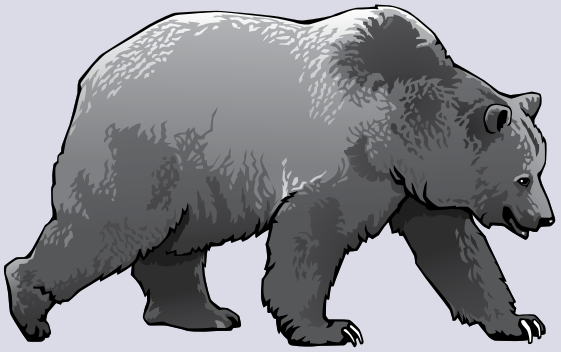
Diet

Bears are generalist omnivores that can only poorly digest parts of plants. They typically forage for plants when they have the highest nutrient availability and digestibility. Although grizzly bears make substantial use of forested areas, they make more use of large, non-forested meadows and valleys than do black bears. The longer, less curved claws and larger shoulder muscles of the grizzly bear makes it better suited to dig plants from the soil and rodents from their caches.

Grizzly bear food consumption is influenced by annual and seasonal variations in available foods. Over the course of a year, army cutworm moths, whitebark pine nuts, ungulates, and cutthroat trout are the highest-quality food items available. In total, grizzly bears in the Greater Yellowstone Ecosystem are known to consume at least 266 species of plant (67%), invertebrate (15%), mammal (11%), fish, and fungi. They will eat human food and garbage where they can get it. This is why managers emphasize that keeping human foods secure from bears increases the likelihood that humans and bears can peacefully

Identify Grizzly Bears and Black Bears

Grizzly Bear



- Rump lower than shoulders.
- Shoulder hump present.
- Long claws for digging.

Black Bear

- Rump higher than shoulders.
- No shoulder hump.
- Short, curved, claws for climbing.

coexist in greater Yellowstone.

Bears spend most of their time feeding, especially during "hyperphagia," the period in autumn when they may gain more than three pounds per day until they enter their dens to hibernate. In years and locations when whitebark pine nuts are available, they are the most important bear food from September through October. However, not all bears have access to whitebark pine nuts, and in the absence of this high-quality food, the bear's omnivory lets them turn to different food sources. Fall foods also include pondweed root, sweet cicely root, grasses and sedges, bistort, yampa, strawberry, globe huckleberry, grouse whortleberry, buffaloberry, clover, horsetail, dandelion, ungulates (including carcasses), ants, false truffles, and army cutworm moths.

From late March, when they come out of hibernation, until mid-May, a grizzly bear's diet primarily consists of elk, bison, and other ungulates. These ungulates are primarily winter-killed carrion (already dead and decaying animals), and elk calves killed by predation. Grizzly bears dig up caches made by pocket gophers. Other items consumed during spring include grasses and sedges, dandelion, clover, spring-beauty, horsetail, and ants. When there is an abundance of whitebark seeds left from the previous fall, grizzly bears will feed on seeds that red squirrels have stored in middens.

From June through August, grizzly bears consume thistle, biscuitroot, fireweed, and army cutworm moths in addition to grasses and sedges, dandelion, clover, spring-beauty, whitebark pine nuts, horsetail, and ants. Grizzly bears are rarely able to catch elk calves after mid-July. Starting around mid-summer, grizzly bears begin feeding on strawberry, globe huckleberry, grouse whortleberry, and buffaloberry. By late summer, false truffles, bistort, and yampa are included in the diet as grasses and other plants become less prominent.

Hibernation

Bears' annual denning behavior probably evolved in response to seasonal food shortages and cold weather. Most bears enter their den by mid-November; although, some males remain active through December before hibernating. Bears hibernate during the winter months in most of the world. The length of denning depends on latitude and varies from a few days or weeks in Mexico to six months or more in Alaska. Pregnant females tend to den earlier and longer than other bears. Grizzly bear females

A grizzly bear emerging from hibernation begins searching for food to replenish lost body mass.

without cubs in Greater Yellowstone den for five months on average.

Grizzly bears will occasionally re-use a den in greater Yellowstone, especially those located in natural cavities like rock shelters. Dens created by digging, as opposed to natural cavities, usually cannot be reused because runoff causes them to collapse in the spring. Greater Yellowstone dens are typically dug in sandy soils and located on the mid to upper one-third of mildly steep slopes (30–60°) at 6,562–10,000 feet (2,000–3,048 meters) in elevation. Grizzly bears often excavate dens at the base of a large tree on densely vegetated, north-facing slopes. This is desirable in greater Yellowstone because prevailing southwest winds accumulate snow on the northerly slopes and insulate dens from sub-zero temperatures.

The excavation of a den is typically completed in 3–7 days, during which a bear may move up to one ton of material. The den includes an entrance, a short tunnel, and a chamber. To minimize heat loss, the den entrance and chamber is usually just large enough for the bear to squeeze through and settle; a smaller opening will be covered with snow more quickly than a large opening. After excavation is complete, the bear covers the chamber floor with bedding material such as spruce boughs or duff, depending on what is available at the den site. The bedding material has many air pockets that trap body heat.

The body temperature of a hibernating bear remains within 12°F (22°C) of their normal body temperature. This enables bears to react more quickly to danger than hibernators who must warm up first. Because of their well-insulated pelts and their lower surface area-to-mass ratio compared to smaller hibernators, bears lose body heat more slowly, which enables them to cut their metabolic rate by 50–60%. Respiration in bears, normally 6–10 breaths per minute, decreases to 1 breath every 45 seconds during hibernation, and their heart rate drops from 40–50 beats per minute during the summer to 8–19 beats per minute during hibernation.

Bears sometimes awaken and leave their dens during the winter, but they generally do not eat, drink, defecate, or urinate during hibernation. They live off a layer of fat built up prior to hibernation. The urea produced from fat metabolism (which is fatal at high levels) is broken down, and the resulting nitrogen is used by the bear to build protein that allows it to maintain muscle mass and organ tissues. Bears may lose 15–30% of their body weight but increase lean body mass during hibernation.

Bears emerge from their dens when temperatures warm up and food is available in the form of winter-killed ungulates or early spring vegetation. Greater Yellowstone grizzly bears begin to emerge from dens in early February, and most bears have left their dens by early May. Males are likely to emerge before females. Most bears usually leave the vicinity of their dens within a week of emergence, while females with cubs typically remain within 1.86 miles (3 kilometers) of their dens until late May.

Life Cycle

Grizzly bears reproduce slowly compared to other land mammals. Females rarely breed before age four, and typically become pregnant once every three years. Grizzly and black bears breed from May through July, and bears may mate with multiple partners during a single season. Because implantation of a fertilized egg in the uterus is delayed, the embryo does not begin to develop until about one month after the mother has denned. This appears to allow her to conserve energy until she enters her den where, in late January or early February, she gives birth to one or two cubs, sometimes three, rarely four. At birth the cubs are hairless and blind, about eight inches (20 cm) long, and weigh from 8 to 12 ounces (224–336 g). They sleep next to the sow, nurse, and grow rapidly. At ten weeks, grizzly bear cubs weigh from 10–20 pounds (4.5–9.0 kg). Male bears take no part in raising cubs, and may actually pose a threat to younger bears. Grizzly bear cubs usually spend 2.5, and sometimes 3.5, years with their mother before she or a prospective suitor chases them away so that she can mate again. Females frequently establish their home range in the vicinity of their mother, but male cubs disperse farther.

Black Bears

The black bear (*Ursus americanus*) is the most common and widely distributed bear species in North America. However, the Greater Yellowstone Ecosystem (GYE) is one of the few areas south of Canada where black bears coexist with the grizzly bears. From 1910 to the 1960s, park managers allowed visitors to feed black bears along park roads, although the National Park Service officially frowned on this activity. During this time, along with Old Faithful, black bears became the symbol of Yellowstone for many people, and are still what some people think of when Yellowstone bears are mentioned. Since 1960, park staff have sought to deter bears from becoming conditioned to human foods.

In Yellowstone, about 50% of black bears are black in color, while others are brown, blond, and cinnamon.

Population

Little is known about the black bear population in Yellowstone or whether it has been affected by the increase in grizzly bear numbers and distribution since the 1970s. Black bears are commonly observed in the park, especially on the northern range and in the Bechler area of the park.

Black bears have few natural predators, although both cubs and adults are occasionally killed by their own kind or by the other large carnivores with which they compete for food—wolves, cougars, and grizzly bears. Vehicle collisions (average = 1 per year) and removals of nuisance bears (average = 1 every 5 years) are not common either. Most black bear mortality in the park is likely attributed to old age or other natural causes.

Outside the park, some black bears are killed during state regulated hunting seasons. As their access to human foods has been reduced, human injuries from black bears in the park have decreased from an average of 45 per year during the 1930s–1960s to approximately one injury every five years since 1980. Black bears are occasionally radio-collared for management and scientific reasons, with the latter focusing on research on habitat selection and multi-carnivore interactions.

Description

In Yellowstone, about 50% of black bears are black in color; others are brown, blond, and cinnamon. Black bears eat almost anything, including grass, fruits, tree cambium, eggs, insects, fish, elk calves, and carrion. Their short, curved claws enable them to climb trees, but do not allow them to dig for roots or ants as well as a grizzly bear can.

The life cycle of black bears is similar to grizzly bears. Like grizzly bears, black bears spend most of their time during fall and early winter feeding during hyperphagia. In November, they locate or excavate a den on a north-facing slope between 5,800–8,600 feet (1,768–2,621 m), where they hibernate until late March.

Males and females without cubs are solitary, except during the mating season, May to early July. They may mate with a number of individuals, but

Black Bears

Number in Yellowstone
Common

Where to See
Tower and Mammoth areas, most often.

Size and Behavior

- Males weigh 210–315 pounds, females weigh 135–200 pounds; adults stand about 3 feet at the shoulder.
- May live 15–30 years.
- Home range: male, 6–124 square miles, female, 2–45 square miles.
- Can climb trees; adapted to life in forest and along forest edges.
- Food includes rodents, insects, elk calves, cutthroat trout, pine nuts, grasses and other vegetation.
- Mates in spring; gives birth the following winter to 1–3 cubs.
- Considered true hibernators.
- Have fair eyesight and an exceptional sense of smell.

occasionally a pair stays together for the entire period. Both genders usually begin breeding at age four. Like grizzly bears, black bears also experience delayed implantation. Total gestation time is 200 to 220 days, but only during the last half of this period does fetal development occur.

Birth occurs in mid-January to early February; the female becomes semiconscious during delivery. Usually two cubs are born. At birth, the cubs are blind, toothless, and almost hairless. After delivery the mother continues to sleep for another two months while the cubs nurse and sleep.

Modern Research

Although grizzly bears in Yellowstone have been studied continuously for more than 50 years, little research has been conducted on the park's black bears since the 1960s. However, a series of black bear studies starting in the early 2000s have provided new insights on black bears, demonstrating their population has also been impacted by changes in the ecosystem, from changes in the grizzly bear population to changes in resource availability.

Recently, research studies utilizing GPS tracking collars and non-invasive DNA samples from hair snares have helped biologists learn more about the black bear population size and density, predatory rates on elk, home range sizes, movements, food habits, and habitat use. Results have shown that black bears in the northern portion of Yellowstone occur at some of the highest densities found in the Greater Yellowstone Ecosystem, which could have implications for other wildlife populations in the region. In addition, collar data has shown that the quality of spring forage influences how black bears navigate around the landscape and annual movement data found that male black bears range farther than previously thought. The results from these studies demonstrate the need to continue studying black bears in Yellowstone as they continue to play an important role in the region.

Grizzly Bears, Black Bears, and Wolves

Grizzly bears, black bears, and gray wolves have historically coexisted throughout a large portion of North America. The behavior of bears and wolves during interactions with each other are dependent upon many variables such as age, sex, reproductive status, prey availability, hunger, aggressiveness, numbers of animals, and previous experience in interacting with the other species. Most interactions between the species involve food, and they usually avoid each other. Few instances of bears and wolves killing each other have been documented. Wolves sometimes kill bears, but usually only cubs.

Wolves prey on ungulates year-round. Bears feed on ungulates primarily as winter-killed carcasses, ungulate calves in spring, wolf-killed carcasses in spring through fall, and weakened or injured male ungulates during the fall rut. Bears may benefit from the presence of wolves by taking carcasses that wolves have killed, making carcasses more available to bears throughout the year. If a bear wants a wolf-killed animal, the wolves will try to defend it; wolves usually fail to chase the bear away, although female grizzlies with cubs are seldom successful in taking a wolf-kill.

A grizzly bear sow with three cubs defends a carcass from wolves on Alum Creek in Hayden Valley, 2010. Most interactions among the grizzly bears, black bears, and wolves involve food. The species usually avoid each other.

Bear Management

Bear management in Yellowstone has changed since the early days of the National Park Service. In the past, bears ate human food at park garbage dumps and were regularly fed by park staff and visitors in campgrounds and along roads, resulting in injuries, deaths, and property damage. In 1970, the park adopted a new bear management plan focused on protecting and maintaining natural populations of grizzly and black bears while ensuring visitors could safely enjoy park resources. This approach remains in place today.

Yellowstone has installed bear-proof food storage boxes in 79% of the park's 1,917 campsites with the goal to complete the installation of bear boxes in every park campsite in 2026.

Our Goals

- **We protect and maintain natural populations of grizzly and black bears**. To do this, we preserve the processes affecting the genetic integrity, distribution, abundance, and behavior of grizzly and black bear populations within the park.
- **We educate visitors and employees about bears and how they can reduce bear-human conflicts.** By offering opportunities to learn about bear ecology and behavior, park visitors and employees can recognize the causes of bear-human conflicts and understand how they can prevent personal injuries, property damage, and bear removals.
- **We make all human food sources unavailable to bears**. Preventing bears' access to human food and garbage is one of the most significant ways to reduce bear management problems and related public safety hazards in the park.
- **We alert visitors about the presence of bears and inherent dangers of recreating in bear country.** All of Yellowstone is bear country, from the park's backcountry trails to the boardwalks around Old Faithful.
- **We provide opportunities for the public to understand, observe, and appreciate wild bears in their natural habitat.** Yellowstone is one of the best places in the world to see bears in their natural habitat, offering unique opportunities to learn and appreciate these wild animals.

Reducing Bear–Human Conflicts

The park takes many actions to prevent bear–human conflicts. The availability of human food and garbage to bears is a major potential cause of bear management problems in Yellowstone. The park aims to eliminate unnatural attractants to bears by using bear-resistant dumpsters and trash cans, monitoring developed areas for litter and food waste, scheduling garbage pickups to prevent overflow of trash cans, requiring bear-resistant food storage in campgrounds, and using bear-resistant fencing around sewage lagoons and garbage transfer stations.

Foraging bears can sometimes be seen close to park roadways, causing significant traffic jams when visitors slow down or park their vehicles on the road. Park staff manage these situations by directing traffic and ensuring visitors maintain a safe viewing distance.

Additionally, to promote human safety, park staff may remove large mammal carcasses from high-use areas, post temporary warnings and closures in areas with recent bear activity, and haze bears out of developed areas. Park staff report all bear sightings, bear signs (tracks, scats, etc.), and bear encounters, as well as bear activity reported by visitors, to the park's Bear Management Office.

The park's bear management philosophy continues to be highly successful in reducing bear–human conflicts and human-caused bear mortalities. Yellowstone is one of the few places in the Greater Yellowstone Ecosystem where most bears die of old age and other natural causes rather than by human actions.

Bear Management Areas

To protect public safety and bear habitat in backcountry areas, Yellowstone wildlife biologists establish "bear management areas" in locations where grizzly bears are known to seasonally concentrate and where there is a high density of elk and bison carcasses. In these areas, certain recreational activities are limited at specific times of year to reduce encounters between bears and humans. Restrictions may include: area closures, trail closures, a minimum group size recommendation, day-use only, or no off-trail travel.

Bear Research

Research and monitoring are also integral parts of bear management. The Interagency Grizzly Bear Study Team (IGBST), formed by the Department of the Interior in 1973, is an interdisciplinary group of scientists and biologists responsible for long-term monitoring and research efforts on grizzly bears in the Greater Yellowstone Ecosystem (GYE). IGBST members include representatives from the US Geological Survey, National Park Service, US Fish and Wildlife Service, US Forest Service, the Eastern Shoshone and Northern Arapaho Tribal Fish and Game Department, and the states of Idaho, Montana, and Wyoming. The main objectives of the team are to: (1) monitor the status and trend of the grizzly bear population in the GYE; and (2) understand the preferred habitat of bears and how human activities on the land affect their well-being.

Grizzlies & the Endangered Species Act

The Yellowstone population of grizzly bears was designated, or listed, as threatened with extinction in 1975. Various agencies and stakeholder groups hold differing opinions about the status of the population and how it should be managed in the future.

Listening for bears in the area during an Interagency Grizzly Bear Study Team bear capture operation.

In September 2018, a federal judge restored protections for grizzly bears within the Greater Yellowstone Ecosystem under the Endangered Species Act. This significant decision came after the U.S. Fish & Wildlife Service removed those protections, or "delisted" the bears, in July 2017. As always, hunting will remain prohibited inside Yellowstone National Park.

The growth and expansion of the grizzly bear population in the Greater Yellowstone Ecosystem is a remarkable conservation success story. The population has grown from 136 in 1975 to 1,030 in 2024 using a population estimate model called Chao2. Scientists think the Yellowstone area population is recovered and may have reached its capacity for resident grizzlies in many areas of the ecosystem. To restore the area effectively, it's crucial to minimize conflicts between people and bears, as well as protect habitat for bears to move around and connect with other bear populations beyond the Greater Yellowstone Ecosystem.

The conservation and management of grizzly bears inside Yellowstone and Grand Teton national parks will not change significantly through this listing and delisting process. Yellowstone and Grand Teton national parks will continue to prevent bears from obtaining human foods, preserve wilderness to minimize human-caused mortalities and disturbances, and maintain our long-term monitoring program. We value grizzlies as a dominant species in the ecosystem—and one that offers amazing wildlife viewing opportunities. Millions of people visit the park with the intention of seeing bears and connecting with the wildness of nature. Wildlife watching also brings economic benefits worth tens of millions of dollars to the region. We are proud that Yellowstone and Grand Teton national parks will continue to be the heart of the grizzly population keeping this magnificent species in the wild.

Reducing conflicts with people is the key to grizzly conservation. Employing best practices for safety in bear country doesn't just protect people, but the welfare of animals as well. When bears kill people or damage property, bears lose. To ensure grizzly bears' safety, learn how to share the landscape with them responsibly.

The US Fish & Wildlife Service is the federal agency that administers the Endangered Species Act. They make all decisions about listing and delisting in consultation with other agencies, Tribes, states, and

the public. Yellowstone will continue to be actively engaged with these partners and provide scientific data related to population estimates, habitat, genetics, and population connectivity.

History of Bear Management

During its first century, Yellowstone National Park was known as the place to see and interact with bears. Hundreds of people gathered nightly to watch bears feed on garbage in the park's dumps. Enthusiastic visitors fed bears along the roads and behaved recklessly to take photographs.

Beginning in 1931, park managers recorded an average of 48 bear-inflicted human injuries and more than 100 incidents of property damage each year in Yellowstone. In 1960, the park implemented a bear management program directed primarily at black bears and designed to reduce the number of bear-caused human injuries and property damages and to re-establish bears in a natural state. The plan included expanding visitor education about bear behavior and the proper way to store food and other bear attractants; installing bear-proof garbage cans; strictly prohibiting feeding of bears; and removing potentially dangerous bears, habituated bears, and bears that damaged property in search of food. The open-pit garbage dumps remained open.

In the early days of National Park Service management in Yellowstone, black bears could be fed along roadsides and at garbage dumps. Today, black bears in the park are wild.

After 10 years, the number of bear-caused human injuries decreased slightly to an average of 45 each year. In 1970, Yellowstone initiated a more intensive program that included eliminating open-pit garbage

Timeline of Listing & Delisting (1975–2018)

- 1975: The grizzly bear was listed as a threatened species, which required recovering the species to a self-sustaining population.
- 1993: A recovery plan is implemented with three specific recovery goals that have to be met for six consecutive years.
- 2000: Draft Conservation Strategy for the Grizzly Bear in the Greater Yellowstone Ecosystem is completed.
- 2002: Conservation Strategy is approved after public comment period—16,794 comments were received. It will be implemented when the grizzly is removed from the threatened species list.
- 2003: Recovery goals are met for the sixth year in a row.
- 2005: US Fish & Wildlife Service proposes removing the grizzly bear from the threatened species list.
- 2006: The Grizzly Bear Recovery Plan is modified to update methods of estimating population size and sustainable mortality.
- 2007: The Greater Yellowstone Ecosystem distinct population segment of grizzly bear population is removed from the threatened species list. Conservation Strategy is implemented. Several groups file lawsuits challenging the decision.
- 2009: A federal district judge overturned the delisting ruling, placing grizzly bears back on the threatened species list claiming: (1) the Conservation Strategy was unenforceable, and (2) that the US Fish & Wildlife Service did not adequately consider the impacts of the potential loss of whitebark pine nuts, a grizzly bear food source.
- 2010: The US Fish & Wildlife Service appeals the decision to keep the grizzly bear on the threatened species list.
- 2011: An appeals court rules the grizzly bear should remain on the threatened species list. They determined that the Conservation Strategy did in fact provide adequate regulatory mechanisms were in place. But the court upheld the lower court ruling that the US Fish & Wildlife Service did not sufficiently address the potential impacts from reduction of whitebark pine and other foods.
- 2013: Yellowstone Ecosystem Subcommittee, the Interagency Grizzly Bear Committee, and Interagency Grizzly Bear Study Team recommend that grizzly bears be removed from the threatened species list because alternative foods are available and the reduction of whitebark pine is not having a significant impact on bears at this time.
- 2017: US Fish & Wildlife Service removes the Yellowstone population of grizzly bears from the threatened species list.
- 2018: A US District Judge restored protections for the Yellowstone-area population of grizzly bears under the Endangered Species Act.

dumps inside the park with the intention of returning bears to a natural diet of plant and animal foods.

Bear researchers and brothers John and Frank Craighead predicted bears would range more widely and come into more conflict with humans as the bears were weaned off of human food. This prediction was realized in the first years of the revised management program: an annual average of 38 grizzly bears and 23 black bears were moved to backcountry areas, and an annual average of 12 grizzly bears and 6 black bears were removed from the population. However, the number of bear–human conflicts decreased to an annual average of 10 each year after 1972. Bear removals also decreased.

In 1983, the park implemented a new grizzly bear management program that emphasized habitat protection in backcountry areas. The park established "bear management areas" that restricted recreational use where grizzly bears were known to concentrate. The goals were to minimize bear–human interactions that might lead to habituation of bears to people, to prevent human-caused displacement of bears from prime food sources, and to decrease the risk of bear-caused human injury in areas with high levels of bear activity. This program continues today.

Listing Under the Endangered Species Act

On July 28, 1975, under the authority of the Endangered Species Act, as amended, the US Fish & Wildlife Service listed four distinct populations of grizzly bear in the lower 48 states as "threatened," in part, because the species was reduced to only about 2% of its former range south of Canada. Five or six small populations were thought to remain, totaling 800 to 1,000 bears. The southernmost—and most isolated—of those populations was in the Greater Yellowstone Ecosystem, where 136 grizzly bears were thought to live in the mid-1970s. The goal of an Endangered Species Act listing is to recover a species to self-sustaining, viable populations that no longer need protection. To achieve this goal, federal and state agencies:

- Stopped the grizzly hunting seasons in the Greater Yellowstone Ecosystem (outside national park boundaries).
- Established the Yellowstone grizzly bear recovery area (Yellowstone National Park, John D. Rockefeller, Jr. Memorial Parkway, portions of Grand Teton National Park, national forests surrounding Yellowstone, Bureau of Land Management lands, and state and private land in Idaho, Montana, and Wyoming).
- Created the Interagency Grizzly Bear Study Team to coordinate bear research and monitoring among the federal agencies and state wildlife managers; the team monitors bear populations and studies grizzly bear food habits and behavior.
- Established the Interagency Grizzly Bear Committee to increase communication and cooperation among managers in all recovery areas, and to supervise public education programs, sanitation initiatives, and research studies.

The Grizzly Bear Recovery Plan was established in 1993 and revised in 2006. This plan guides management when the grizzly is on the threatened species list. Bear managers will use the Grizzly Bear Conservation Strategy if the Greater Yellowstone Ecosystem population of grizzly bear is removed from the threatened and endangered species list. The Conservation Strategy is the long-term guide for managing and monitoring the grizzly bear population and assuring sufficient habitat to maintain recovery. It emphasizes coordination and cooperative working relationships among management agencies, landowners, and the public to ensure public support, continue the application of best scientific principles, and maintain effective actions to benefit the coexistence of grizzlies and humans. It incorporates existing laws, regulations, policies, and goals. The strategy has built-in flexibility:

- Grizzly–human conflict management and bear habitat management are high priorities in the recovery zone, which is known as the Primary Conservation Area. Bears are favored when grizzly habitat and other land uses are incompatible; grizzly bears are actively discouraged and controlled in developed areas.
- State wildlife agencies have primary responsibility to manage grizzly bears outside of national parks, including bears on national forests; national parks manage bears and habitat within their jurisdictions.
- State and federal wildlife managers will continue to monitor the grizzly population and habitat conditions using the most feasible and accepted techniques.
- Managers will remove nuisance bears conservatively and within mortality limits outlined

above, and with minimal removal of females; they will emphasize removing the human cause of conflict rather than removing a bear.
- Outside the Primary Conservation Area, states develop management plans that define how grizzly bears are to be managed.

Your Safety in Bear Country

On average, bears injure one person each year within Yellowstone National Park. In 2011 and 2015, in separate incidents, three people were killed by bears inside the park. Hiking in bear country takes appropriate preparation. Before you set out, ask about area closures, advisories, and seasonal food habits of local bears. Know what to do if you encounter a bear unexpectedly. Resources are available at visitor centers—where public bear spray demonstrations are offered in summer programs—and on the park website (www.nps.gov/yell/planyourvisit/safety.htm).

Statistically, you're most likely to have an encounter with bears at park roadsides. If you see a bear while driving, do not stop. Regardless of what other people may do, keep moving to the next paved pullout and park safely. If the bear is within 100 yards, watch and take pictures from inside your car. Comply with instructions of park staff on the scene.

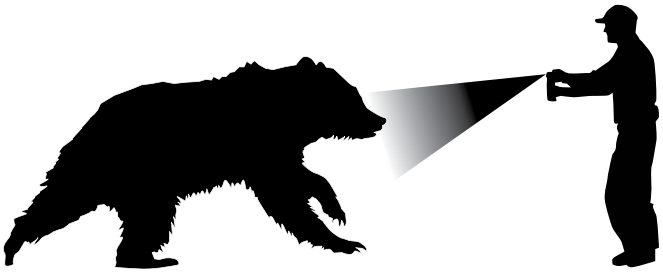
As you venture beyond developed areas, stay clear of animal carcasses. Bears are very protective of carcasses as a food source. A single dead animal can attract and hold more than a dozen bears. Many may be bedded down nearby. Watch for gatherings of ravens, magpies, and coyotes. They can be good first indicators that a carcass is nearby. Leave the area immediately by the same route you used to get there.

Bears don't like surprises. Be vigilant about alerting unseen bears to your presence. Some trail conditions make it hard for bears to see, hear, or smell approaching hikers. Make noise by calling out and clapping your hands loudly at regular intervals. Bells are not enough. If you see a bear that hasn't noticed you, leave the area.

Know how to react. If you have a surprise encounter with a bear, do not run. Face the bear and slowly back away. If a bear charges you, stand your ground and use your bear spray. Do not drop your pack. It can help to protect your back from injury. If a bear makes contact with you, fall to the ground onto your stomach and play dead.

A sow protecting her cubs is one of the most dangerous situations you can face in nature. As cute as cubs can be, no photograph of them is ever worth risking personal injury. Always assume mother is nearby and ready to protect her young. For the safety of others, please report all bear incidents and wildlife encounters to a park ranger immediately. Before you set out to enjoy park trails be sure to learn what to do if you unexpectedly encounter a bear.

Watch for fresh tracks and scat.



Bear spray works. Know how to use it.

- **Be alert** for bears and watch for fresh tracks or scat.
- **Make noise** in areas where you can't see far around you.
- **Carry bear spray** that is readily accessible and know how to use it.
- **Hike in groups** of three or more people.
- **Do not run.** If you encounter a bear, back away slowly.

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Bison

Yellowstone is the only place in the United States where bison (*Bison bison*) have lived continuously since prehistoric times. Yellowstone bison are exceptional because they comprise the nation's largest bison population on public land. Unlike most other herds, this population has thousands of individuals that are allowed to roam relatively freely over the expansive landscape of Yellowstone National Park and some nearby areas of Montana. They also exhibit wild behavior like their ancient ancestors, congregating during the breeding season to compete for mates, as well as migration and exploration that result in the use of new habitat areas. These behaviors have enabled the successful restoration of a population that was on the brink of extinction just over a century ago.

However, some Yellowstone bison are infected with brucellosis, a livestock disease that can be transmitted to wild bison and elk as well as to cattle through contact with infected fetal tissue. To prevent conflicts with ranching and other activities outside the park, the National Park Service (NPS) works with other federal, state, and tribal agencies to manage and develop policies for bison access to habitat in Montana. Conservation of wild bison is one of the most complex of Yellowstone's resource issues. All of the interested parties bring their own wide-ranging values and objectives to the debate.

The bison is the largest land mammal in North America. Each year, bison injure park visitors who approach too closely.

Description

Bison are the largest land-dwelling mammal in North America. Males (2,000 lbs/900 kg) are larger than females (1,100 lbs/500 kg) and both are generally dark chocolate-brown in color, with long hair on their forelegs, head, and shoulders, and short, dense hair (1 in/3 cm) on their flanks and hindquarters. Calves of the year are born after 9 to 9½ months of gestation. They are reddish-tan at birth and begin turning

Quick Facts

Number in Yellowstone

- Population estimates in recent years range from 3,000 to nearly 6,000.
- The 2025 population estimate was 5,300; this includes two primary breeding herds: northern and central.

Where to See

- Year-round: Hayden and Lamar valleys.
- Summer: grasslands.
- Winter: hydrothermal areas and along the Madison River. Blacktail Deer Plateau, Tower, and the Gardiner Basin.

Size and Behavior

- Male (bull) weighs up to 2,000 pounds, female (cow) weighs up to 1,000 pounds.
- May live 12–15 years; a few live as long as 20 years.
- Feed primarily on grasses and sedges.
- Mate in late July through August; give birth to one calf in late April or May.
- Can be aggressive, are agile, and can run up to 30 miles per hour.

History

- Yellowstone is the only place in the lower 48 states to have a continuously free-ranging bison population since prehistoric times.
- In the 1800s, market hunting and the US Army nearly caused the extinction of the bison.
- By 1902, poachers had reduced the Yellowstone population to about two dozen animals.
- The US Army, who administered Yellowstone at the beginning of the 20th century, protected these bison from further poaching.
- Bison from private herds were used to establish a herd in northern Yellowstone.
- For decades, bison numbers were reduced due to belief that they, along with elk and pronghorn, were over-grazing the park.
- By 1968, herd reductions of bison ceased.
- Reductions began again in the 2000s due to increasing numbers and litigation over migration into Montana.

brown after 2½ months. Both sexes have relatively short horns that curve upward, with males' horns averaging slightly longer than those of adult females.

All bison have a protruding shoulder hump. Large shoulder and neck muscles allow bison to swing their heads from side to side to clear snow from foraging patches, unlike other ungulates that scrape snow away with their front feet. Bison are agile, are strong swimmers, and can run 35 miles per hour (55 kph). They can jump over objects about 5 feet (1.5 m) high and have excellent hearing, vision, and sense of smell.

FREQUENTLY ASKED QUESTION:

What is the difference between a bison and a buffalo?

In North America, both "bison" and "buffalo" refer to the American bison (*Bison bison*). Generally, "buffalo" is used informally; "bison" is preferred for more formal or scientific purposes. Early European explorers called this animal by many names. Historians believe that the term "buffalo" grew from the French word for beef, "boeuf." Some people insist that the term "buffalo" is incorrect because the "true" buffalo exist on other continents and are only distant relatives. In this book, we use "bison."

Behavior

Bison are mostly active during the day and at dusk, but may be active through the night. They are social animals that often form herds, which appear to be directed by older females. Group sizes average about 20 bison during winter, but increase in summer to an average of about 200, with a maximum of about 1,000 during the breeding season (known as the rut) in July and August. Bison are sexually mature at age two. Although female bison may breed at these younger ages, older males (>7 years) participate in most of the breeding.

During the rut mature males display their dominance by bellowing, wallowing, and engaging in fights with other bulls. The winners earn the right to mate with receptive females. Once a bull has found a female who is close to estrus, he will stay by her side until she is ready to mate. Then he moves on to another female. Following courtship, mature males separate and spend the rest of the year alone or in small groups. Group sizes decrease through autumn and into winter, reaching their lowest level of the year during March and April.

The bull bellows during rutting season, while a disinterested cow continues to graze.

Diet

Yellowstone bison feed primarily on grasses, sedges, and other grass-like plants (more than 90% of their diets) in open grassland and meadow communities throughout the year. They also eat forbs (weeds and herbaceous, broad-leafed plants) and browse (the leaves, stems, and twigs of woody plants) through the year, but those usually comprise less than 5% of the diet. They typically forage for 9 to 11 hours daily. Bison are ruminants with a multiple-chambered stomach that includes microorganisms such as bacteria and protozoa to enable them to effectively digest plant material. Bison alternate between eating and ruminating, which is regurgitating partially digested food and chewing it again, to allow microorganisms to further break down plant material into volatile fatty acids and other compounds. Their large digestive tract allows them to digest lower quality foods with greater efficiency than other ungulates such as cattle, deer, or elk.

Interaction with Other Wildlife

Wolves and grizzly bears are the only large predators of adult bison. Dead bison provide an important source of food for scavengers and other carnivores. Bison will rub against trees, rocks, or in dirt wallows in an attempt to get rid of insect pests. Birds such as the magpie perch on a bison to feed on insects in its coat. The cowbird will also follow close behind a bison, feeding on insects disturbed by its steps.

Migration

Most other ungulates of the Greater Yellowstone Ecosystem follow the "green wave" of sprouting plants and grasses during spring because young plants are highly nutritious. Bison begin spring by leaving winter ranges in sync with the green wave

but let it pass them by as they migrate and graze, not reaching summer ranges until weeks after green-up. Bison can move out-of-sync with forage green-up because they engineer the ecosystem. Rather than just moving to find the best foods, bison create high-quality foods by how they move and graze. When bison let the green wave pass them by, they spend their time returning to graze the same areas repeatedly at high intensity. The behavior keeps plants growing, although the plants never appear more than a few inches tall, and allows bison to keep getting highly nutritious foods. In winter, bison will move from their summer ranges to lower elevation as snow accumulates and dense snowpack develops. Bison migrate up to 70 miles between summer and winter ranges. Most animals travel about 1,000 miles over the course of the year by repeatedly leaving and returning to the same areas. This means bison travel a greater distance than any other ungulate in the Greater Yellowstone Ecosystem.

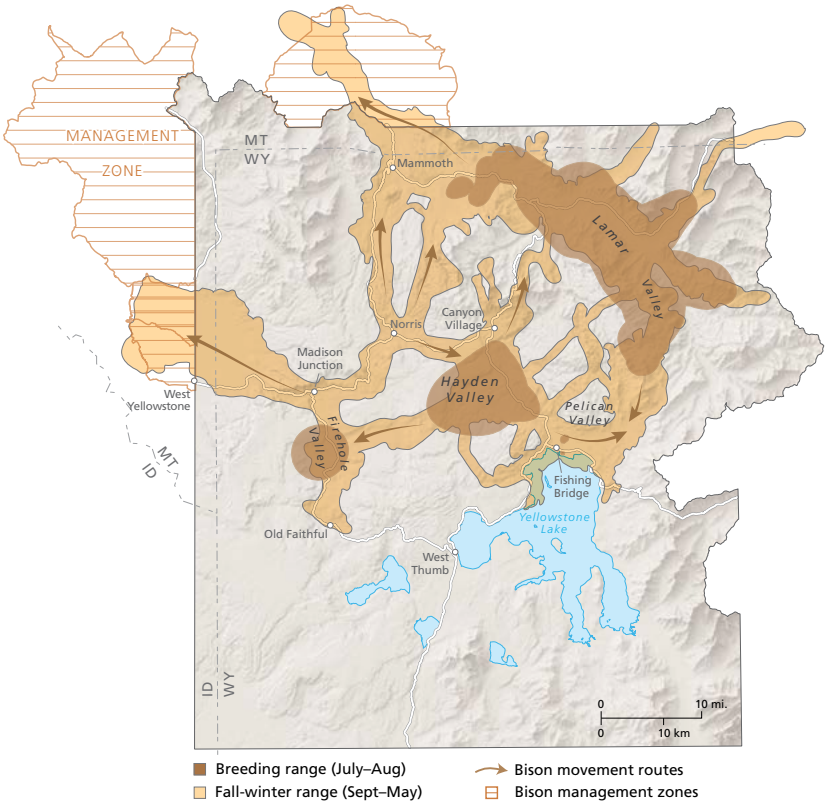
Habitat

Yellowstone bison historically occupied approximately 7,720 square miles (20,000 km2) in the headwaters of the Yellowstone and Madison rivers. Today, this range is primarily restricted to Yellowstone National Park and some adjacent areas of Montana. The bison population lives and breeds in the central and northern regions of the park. The northern breeding herd congregates in the Lamar Valley and on adjacent plateaus for the breeding season. During the remainder of the year, these bison use grasslands, wet meadows, and sage-steppe habitats in the Yellowstone River drainage, which extends 62 miles (100 km) between Cooke City and the Paradise Valley north of Gardiner, Montana. The northern range is drier and warmer than the rest of the park, and generally has shallower snow than in the interior of the park.

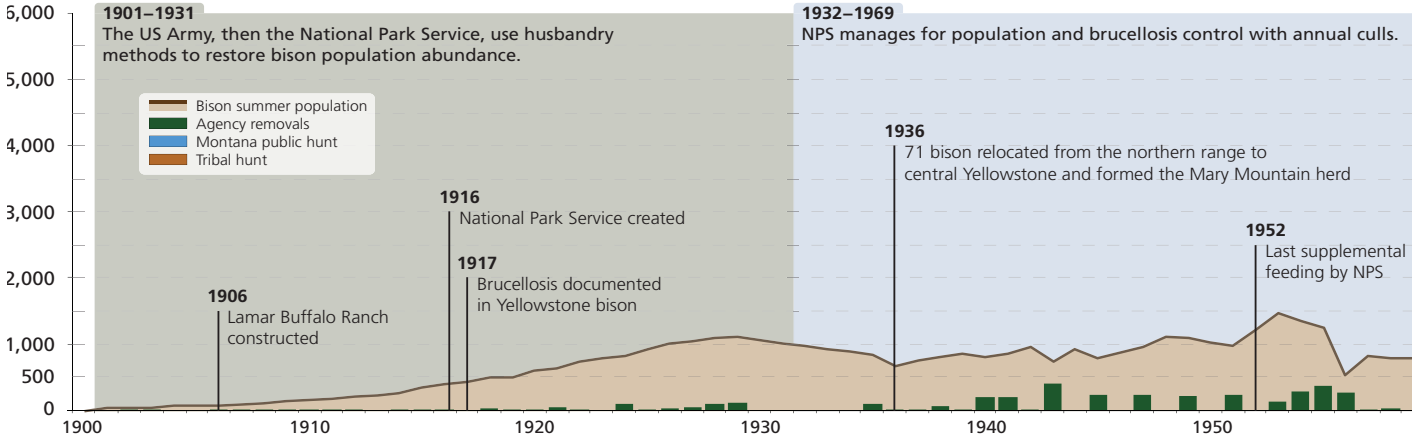
The central breeding herd occupies the central plateau of the park, from the Pelican and Hayden valleys with a maximum elevation of 7,875 feet (2,400 m) in the east to the lower-elevation and thermally- influenced Madison headwaters area in the west. Winters are often severe, with deep snows and temperatures reaching -44°F (-42°C). This area contains a high proportion of moist meadows composed of grasses, sedges, and willows, with upland grasses in drier areas. Bison from the central herd congregate in the Hayden Valley for breeding. Most of these bison move among the Madison, Firehole, Hayden, and Pelican valleys during the rest of the year. However, increasing numbers of bison are travelling to the northern portion of the park and mixing with the northern herd. Some of these bison do not return to the Hayden Valley for the subsequent breeding season, and instead breed and rear young on their new range.

Conservation

Yellowstone has played a key role in the conservation of wild bison in North America. In fact, they've been so successful that the challenge now is to manage a rapidly growing population of migratory bison that frequently roam beyond our borders onto private land and land managed by other agencies.



The seasonal distribution of Yellowstone bison is shown here in comparison with the Interagency Bison Management Plan management areas.



Estimated summer population and the number of bison removed the following winter, 1900–2020.

History of Bison Management

Near Extinction & Recovery

The American bison (*Bison bison*) once roamed across most of North America in numbers that reached into the tens of millions. Such abundance made the bison a critical part of Native American culture: every part of the bison provided something for their way of life. Before horses and gunpowder arrived in North America, native people hunted bison on foot. One technique involved stampeding dozens or hundreds of animals off cliffs where they would fall to their deaths. A single "jump" could sustain the members of a tribe for an entire year, providing food as well as materials for clothing, shelter, tools, and more.

As European Americans settled the west in the 1800s, the U.S. Army began a campaign to remove Native American tribes from the landscape by taking away their main food source: bison. Hundreds of thousands of bison were killed by U.S. troops and market hunters. By the late 1880s, the great herds of bison that once dominated the landscape were nearly gone. Some animals found protection on private ranches. In the Yellowstone area, their numbers dwindled to about two dozen bison that spent winter in Pelican Valley.

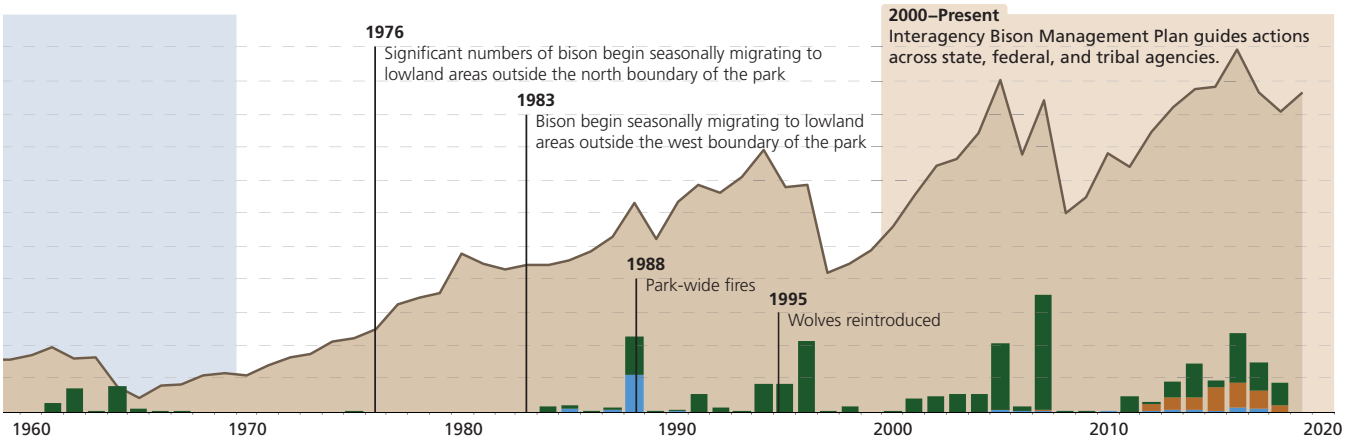

Historic bison management operations at the Lamar Buffalo Ranch.

In one of the first efforts to preserve a wild species through protection and stewardship, Yellowstone's managers set about recovering the bison population. In 1902, they purchased 21 bison from private owners and raised them in Mammoth and then at the historic Lamar Buffalo Ranch. Eventually, these animals began to mix with the park's free-roaming population and by 1954, their numbers had grown to roughly 1,300 animals.

Population Growth & Conflict

Yellowstone bison reproduce and survive at relatively high rates compared to many other large, wild mammals, so even as the population recovered managers limited its growth with frequent culling. Hundreds of animals were removed to start or supplement herds on other public and tribal lands. Even more were killed and given to Native American tribes or relief agencies. But a moratorium on culling beginning in 1969 resulted in the bison population increasing dramatically: from 500 animals in 1970 to 3,000 in 1990. At the same time, elk numbers increased to more than 19,000 animals in the late 1980s. As bison and elk numbers increased, they began to leave the park in greater numbers. Only a few bull bison left the park prior to 1975, but as bison numbers increased, groups of bison began migrating across the north and west boundaries of Yellowstone to expand their winter range and pioneer new territory.

As they left the park, bison encountered a changed world. In the century since bison roamed a continent



of open space, the grassy river valleys and plains they used to graze had been settled and developed by people, much of it for agriculture. The landscape had become a maze of fenced pastures, houses, and highways. Large groups of 1,000-pound animals searching for food create challenges for people sharing that landscape, both in terms of human safety and because bison want to eat the same grass ranchers grow to feed their livestock.

To further complicate things, bison and elk in the Greater Yellowstone Ecosystem carry brucellosis, a disease that can be transmitted to livestock and induce abortions or stillbirths in infected animals. Brucellosis has an economic impact on ranchers because it affects the reproductive rate and marketability of their animals, so park and state wildlife officials have gone to great lengths to prevent bison from mixing with cattle. Between 1985 and 2000, about 3,100 bison were killed as they tried to migrate out of the park: some were captured and shipped to slaughter, others were shot by hunters or state agents.

These actions generated a lot of controversy. Meanwhile, the bison population continued to grow, as did state and federal pressure to keep brucellosis out of livestock. In 1995, the state of Montana sued the National Park Service for allowing bison to leave the park. After five years of litigation and mediation, the state of Montana and the federal government developed the Interagency Bison Management Plan (IBMP) to guide the management of bison in and around Yellowstone. As part of this plan, five agencies and three tribal entities work to sustain a wild, wide-ranging bison population and reduce the risk of brucellosis transmission from bison to cattle.

In the decades since the IBMP was created, the bison population has ranged between 2,400 and 6,000 animals. There have been no cases of bison transmitting brucellosis directly to cattle, in part due to efforts by federal and state agencies to maintain separation between these animals. The state of Montana now allows bison to occupy some habitat adjacent to the park that was previously off-limits, including year-round in some areas, which is a major conservation advancement. However, lack of tolerance for wild bison in most areas outside Yellowstone continues to limit the restoration of this iconic species. Large parts of their historic winter ranges are no longer available due to human development, and because states only allow limited numbers of bison in areas near the park.

A Future for Bison

Many people don't like the fact that animals from a national park are sent to slaughter. We don't like it either. We'd like to see more tolerance for migrating bison on public lands in surrounding states; similar to deer, elk, and other ungulates. The park isn't big enough to let bison numbers increase without more available habitat to sustain them, but we cannot force adjacent states to tolerate more migrating bison.

We have placed some captured bison in the Bison Conservation Transfer Program so animals that repeatedly test negative for brucellosis can be used to start conservation herds elsewhere. Since 2019, bison have been transferred to the Fort Peck Assiniboine and Sioux Tribes in northeastern Montana. Afterward, bison are then transferred to the InterTribal Buffalo Council and given to other member Tribes across North America. In fall 2022, Yellowstone built a partnership with Yellowstone Forever and the Greater Yellowstone Coalition to more than double the Bison Conservation Transfer Program's capacity and lower the number of animals sent to slaughter. Using the new facility in

coordination with APHIS and their leased facility outside the park will result in transferring more bison per year to Tribes as an alternative to slaughter.

Also, we would like hunting outside the park to become a more successful management tool, as it is for other species. For this to happen, bison need to be allowed to disperse more widely and pioneer new areas away from Yellowstone. This would entail expanding tolerance for bison in Montana, reducing hunter concentrations along the park boundary, and promptly responding to conflicts to aid communities living with bison.

The state of Montana and some Native American Tribes have proposed hunting bison within Yellowstone National Park. However, the Lacey Act of 1894 prohibits hunting and the possession or removal of wildlife from the park, as well as frightening or driving wildlife from the park for hunting or other reasons. In addition, park managers oppose hunting in the park because it would affect the behavior of many different animals and drastically change the experiences of visitors.

Bison Management

The National Park Service (NPS) has sole authority to manage bison within Yellowstone National Park's boundaries. However, unlike other migratory wildlife, bison are managed differently due to Montana's limited tolerance for their presence outside the park. To address this, the NPS coordinates with other federal agencies, the state of Montana, and American Indian Tribes under the Interagency Bison Management Plan (IBMP), which was established in 2000 and signed by the secretaries of Agriculture and Interior and the governor of Montana.

In 2024, the NPS developed a new bison management plan, formalized through a Final Environmental Impact Statement and Record of Decision under the National Environmental Policy Act. This update responds to new scientific information, changing circumstances, and recent litigation. The 2024 plan outlines how the NPS will manage bison within the park and sets conditions for supporting partners' efforts outside the park, while maintaining the primary goals of the IBMP. To achieve these shared goals, the NPS will continue collaborating with federal, state, and American Indian Tribe partners under the existing IBMP framework to coordinate the plan's implementation.

A bison group on the move in Lamar Valley at sunrise.

Our Goals

- **We preserve a sustainable population of 3,500-6,000 wild, migratory bison.** Yellowstone's bison are the closest resemblance left today of the vast herds that once roamed the continent. Bison act as ecosystem engineers fundamentally designing grassland ecosystems, and they hold significant cultural importance to people, with a connection spanning thousands of years.
- **We coordinate with federal, state, and Tribal partners to manage the bison population.** Yellowstone bison must be managed because the population is growing exponentially and there is limited winter range for bison within the park. Like other wildlife, bison migrate out of the park to find food in winter, but unlike other wildlife, there is limited tolerance for them outside the park. Yellowstone works with its partners to control numbers, limit bison migrating out of the park, and help Tribes restore Yellowstone bison to their livelihoods.
- **We develop the best available science to preserve our national mammal.** Making decisions about bison population management requires contemporary research on population viability, habitat use, and the effects that bison have on grasslands to ensure a sustainable bison population and habitat.

Conserving Yellowstone Bison

Archeological evidence shows that bison have inhabited the Greater Yellowstone Area for over 10,000 years. By 1902, however, only 23 bison remained in the park—representing the last wild bison in North

Bison field crew leader collects bison DNA samples during the rut.

Bison in holding pens to prepare for transfer to Fort Peck Indian Reservation.

America. Throughout the 1900s, dedicated conservation efforts helped Yellowstone's bison population recover, making it one of the most significant conservation successes for bison worldwide. As the population rebounded, bison began migrating out of the park and into Montana, leading to one of the most complex wildlife management challenges of our time.

NPS Bison Management Plan

Multiple federal, state, and Tribal entities are involved in managing bison and hold different opinions on how bison should be managed. These opinions are intensified by each entity's varying authority over bison management, which depends on the specific lands where the bison are located—whether within Yellowstone, on adjacent US Forest Service lands, or on private lands in Montana.Yellowstone's new Bison Management Plan aims to secure a sustainable future for our national mammal by updating our tools for population control, setting a target population range, and establishing strategies for managing brucellosis within the bison population. The 2024 plan outlines three methods to control bison numbers: the Bison Conservation Transfer Program (BCTP), the Tribal Food Transfer Program (TFTP), and regulated Tribal harvests and state hunts.

Bison Conservation Transfer Program (BCTP)

The 2024 plan prioritizes the BCTP to capture, identify, and transfer brucellosis-free bison to Tribes. As bison migrate north out of the park, some are captured at Yellowstone's bison facility and enter the program. The goal is to add 100–300 animals annually, though this may vary if fewer bison migrate or if the park population falls below 3,000. About 30–40% of captured bison qualify, as eligible animals must test negative for brucellosis and be under three years of age.

Once accepted into the program, bison go through multiple testing phases. The first phase is conducted at Yellowstone quarantine facilities or on private land leased by the Animal and Plant Health Inspection Service (APHIS) near the park's northern boundary. This phase, which takes about 300 days for males and 2.5 years for females, ends with certification as brucellosis-free by APHIS and Montana animal health officials. The bison are then moved to the Assiniboine and Sioux Tribes of the Fort Peck Indian Reservation, where they undergo one additional year of testing in an assurance facility. Afterward, the Fort Peck Tribes transfer some bison to the InterTribal Buffalo Council, which distributes them to other Tribes across North America.

Tribal Food Transfer Program (TFTP)

Yellowstone transfers bison to Tribes, who then process them for their meat and hides at Tribal meat-processing facilities. This program supports Tribal food sovereignty and provides bison meat to Tribal members who may not have access to harvest opportunities outside the park.

Tribal Harvests & State Hunts

Currently, eight American Indian Tribes exercise their treaty rights to harvest bison outside Yellowstone, with each Tribe managing its own harvests. We support Tribal efforts to expand harvests outside the park, enhancing access to traditional food and cultural resources. The state of Montana also manages a smaller public hunt. Together, the harvests and hunt help manage bison populations effectively, especially under favorable weather conditions.

The migration of bison outside of Yellowstone National Park (the boundary is marked here with the 1903 arch at the North Entrance) is a challenging issue for the greater Yellowstone area.

Target Population Range & Adaptive Management

Managing wildlife populations to a static number isn't realistic or suitable for bison, as their migration patterns fluctuate with the weather, causing the number of bison exiting the park to vary significantly each year. For this reason, the Bison Management Plan sets a flexible target population range of 3,500 to 6,000 animals.

Each year's management strategy is adjusted to the current bison population and migration numbers, with specific guidelines provided to IBMP partners and Tribes each fall to help ensure that removals do not harm the population's health. The management tools applied each year depend on the following population thresholds:

- **Above 5,200:** We rely primarily on Tribal harvests and state hunts to manage numbers. If harvests and hunts are unable to reduce numbers, we commit to decreasing the population by removing additional animals through the TFTP. We prioritize the removal of brucellosis-infected bison, which stabilizes or decreases brucellosis prevalence over time.
- **Below 5,200:** We only place bison in the BCTP and utilize the TFTP to remove brucellosis-positive bison that are identified in selecting animals for the program.
- **Near 3,000:** We protect the population inside the park and encourage partners to reduce hunting outside the park.

Studying Yellowstone Bison

Each summer, bison managers conduct aerial counts of the bison population using fixed-wing aircraft. We integrate these counts with survival rates of radio-collared bison and ground surveys of male-to-female and female-to-calf ratios to estimate the population status. We then use population modeling techniques to provide management recommendations to our partners for implementing hunts in winter.

Genetic Monitoring

Bison in the park are a metapopulation or a single population with two distinct breeding groups. During the July and August breeding season, we collect genetic samples from bison using biopsy dart projectiles. From these samples, we determine gene frequencies and track genetic diversity to help ensure that we are sustaining the population.

Rangeland Monitoring & Grazing Experiments

Bison use only about 40% of the grazeable acreage in the park, but in some areas, like Lamar Valley, they graze intensively. We use small grazing exclosures throughout the high-grazing areas of the park to evaluate consumption patterns and impacts on soil health, plant productivity, and nutrient cycling. We monitor long-term exclosures to see how plant communities are changing with and without bison.

Bison Stats

- Approximately 925 bison were removed from the population during winter 2024/2025, including 97 bison placed in the BCTP, 769 bison captured by the NPS and transferred to Tribes through the TFTP, and 59 bison harvested by state hunters or Tribal members.
- The NPS counted the population in August 2025 and recommended a removal objective to the IBMP partners in fall based on the 2024 Bison Management Plan.
- Yellowstone's bison population has grown steadily over the last 50+ years: from 500 animals in 1970 to 5,300 in 2025. Yellowstone bison represent a unique source of genetic diversity.
- Designation of bison as our national mammal does not provide any special protection to bison.

Learn more about bison management at **https://www.nps.gov/yell/learn/management/bison.htm**

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Staff Reviewers

Chris Geremia, Senior Wildlife Biologist

Bighorn Sheep

Although widely distributed across the Rocky Mountains, bighorn sheep (*Ovis canadensis*) persist chiefly in small, fragmented populations that are vulnerable to sudden declines as a result of disease, habitat loss, and disruption of their migratory routes due to roads and other human activities. Between 10 and 13 interbreeding bands of bighorn sheep occupy steep terrain in the upper Yellowstone River drainage, including habitat that extends more than 20 miles north of the park. These sheep provide visitor enjoyment as well as revenue to local economies through tourism, guiding, and sport hunting. Mount Everts receives the most concentrated use by bighorn sheep year-round.

All bighorn sheep have horns. The rings on horns can be used to determine age, though it is easier to count the rings on a ram (*left*).

Population

From the 1890s to the mid-1960s, the park's bighorn sheep population fluctuated between 100 and 400. Given the vagaries of weather and disease, bighorn sheep populations of at least 300 are desirable to increase the probability of long-term persistence with minimal loss of genetic diversity. The count reached a high of 487 in 1981, but a keratoconjunctivitis (pinkeye) epidemic caused by Chlamydia reduced the population by 60% the following winter, and the population has been slow to recover. Although the temporary vision impairment caused by the infection is rarely fatal for domestic sheep that are fenced and fed, it can result in death for a sheep that must find its forage in steep places.

During the 2018 survey, a total of 345 bighorn sheep were observed, including 214 in Montana and 131 inside Yellowstone National Park. This is slightly

Quick Facts

Number in Yellowstone
345 in the northern Yellowstone area in 2018 (131 counted inside the park).

Where to See
- Summer: slopes of Mount Washburn, along Dunraven Pass.
- Year-round: Gardner Canyon between Mammoth and the North Entrance.
- Also: On cliffs along the Yellowstone River opposite Calcite Springs; above Soda Butte; in the eastern Absaroka mountains.

Behavior and Size
- Average life span: males, 9–12 years; females 10–14 years.
- Adult male (ram): 174–319 pounds, including horns that can weigh 40 pounds. The horns of an adult ram can make up 8–12% of his total body weight.
- Adult female (ewe): up to 130 pounds.
- Horn growth is greatest during the summer and early in life. Female horns grow very little after four to five years, likely due to reproductive costs.
- The horn size of bighorn sheep rams can influence dominance and rank, which affects social relationships within herds.
- Older ram horns may be "broomed" or broken at the tip, which can take off one to two years of growth.
- Mating season begins in November.
- Ram skulls have two layers of bone above the brain that function as a shock absorber, an adaptation for the collision of head-on fighting that is used to establish dominance between rams of equal horn size, especially during mating.
- One to two lambs born in May or June.

Habitat
- Feed primarily on grasses; forage on shrubby plants in fall and winter.
- Rocky Mountain bighorn sheep, found in greater Yellowstone, differ from other currently recognized subspecies in the United States: Desert bighorn sheep, which is currently listed as an endangered species, Dall sheep found in Alaska and northwestern Canada, and Stone's sheep, which are a subspecies of Dall sheep.

Management
- Early reports of large numbers of bighorn sheep in Yellowstone have led to speculation they were more numerous before the park was established.
- A chlamydia (pinkeye) epidemic in 1981–1982 reduced the northern herd by 60%.

Most bighorn sheep in Yellowstone are migratory, wintering in lower-elevation areas along the Yellowstone, Lamar, and Gardner rivers, and moving to higher-elevation ranges from May through October.

Bighorn sheep exhibit some habituation to humans. Be alert to them along the road and never feed them.

below the 10-year average of 358 sheep. Additionally, in 2018, lamb-to-ewe ratios of 20:100 were below the 10-year average (28:100), with very low lamb recruitment observed on the Cinnabar, Corwin, and Mt. Everts winter ranges.

During 2005-2015, the population increased steadily. A decline occurred in 2015 related to an all-ages pneumonia event. In spite of the 2015 decline, overall bighorn sheep numbers in the northern Yellowstone remain substantially above the long-term average.

Competition with Other Species

Bighorn sheep populations that winter at high elevations are often small, slow-growing, and low in productivity. Competition with elk as a result of dietary and habitat overlaps may have hindered the recovery of this relatively isolated population after the pinkeye epidemic. Rams may be hunted north of the park, but the State of Montana has granted few permits in recent years because of the small population size.

Although wolves occasionally prey on bighorn sheep, the population has increased since wolf reintroduction began in 1995. Longer-term data are needed to show whether sheep abundance may be inversely related to elk abundance on the northern range. The Wyoming Game and Fish Department, Montana Fish, Wildlife & Parks, the Idaho Department of Fish and Game, Montana State University, the US Forest Service, and several nongovernmental organizations are cooperating with the National Park Service to study how competition with nonnative mountain goats, which were introduced in the Absaroka Mountains in the 1950s, could affect bighorn sheep there.

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Staff Reviewer

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Mountain Goats

Descendants of mountain goats (*Oreamnos americanus*) introduced in the Absaroka and Madison mountain ranges during the 1940s and 1950s established a population in Yellowstone National Park in the 1990s. They have reached a relatively high abundance in the northeastern and northwestern portions of the park. Investigations of paleontological, archeological, and historical records have not found evidence that the mountain goat is native to greater Yellowstone.

Many people consider the goats a charismatic component of the ecosystem, including those who value the challenge of hunting them outside the park. But the colonization has raised concerns about the goats' effects on alpine habitats. Competition with high densities of mountain goats could also negatively affect bighorn sheep, whose range overlaps that of mountain goats.

Habitat

Mountain goats live in alpine habitats. Studies of alpine vegetation in the northeast portion of the park during 2002 and 2003 suggest that ridge-top vegetation cover is lower, and barren areas along alpine ridges are more prevalent in areas that have received relatively high goat use. Studies by Idaho State University and the National Park Service during 2008–2010 suggest goats are affecting the soil chemistry of sites they inhabit by increasing the availability of soil nitrogen through deposition of urine and feces. Soil rockiness may be increasing slightly over time at sites with high goat presence, but no large-scale effects have been detected so far with respect to vegetation (species, community structure).

Mountain goats are not native to the Greater Yellowstone Ecosystem.

Colonization of suitable habitats south of The Thunderer and along the eastern park boundary within the Absaroka Mountain Range appears to be occurring. During a 2022 survey, mountain goats were observed from Notch Peak to Eagle Peak, indicating they continue to expand their range. Only males (billies) were observed; however, park biologists anticipate that the expansion southward will continue and eventually include females (ewes) and reproductive groups.

Quick Facts

Nonnative species

Number in Yellowstone
200–300 in and adjacent to Yellowstone.

Where to See

- Infrequently seen; northeastern and northwestern portions of the park in alpine habitat.
- Winter: steep, south-facing slopes, windblown ridge tops; Spring: south- and west-facing cliffs; Summer: meadows, cliffs, ravines, and forests.

Behavior and Size

- Mature male (billy) weighs 300 or more pounds; female (nanny) weighs 150 pounds.
- Young (kids) born in late May–June.
- Females usually begin to breed at 2½ years.
- Live in precipitous terrain.
- Both sexes have horns; females' horns curve less and are thinner and sometimes longer than males.

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Staff Reviewer
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Elk

Yellowstone provides summer range for an estimated 10,000–20,000 elk (*Cervus canadensis*) from six to seven herds, most of which winter at lower elevations outside the park. These herds provide visitor enjoyment as well as revenue to local economies through hunting outside the park. As Yellowstone's most abundant ungulate, elk comprise approximately 85% of winter wolf kills and are an important food for bears, mountain lions, and at least 12 scavenger species, including bald eagles and coyotes. Competition with elk can influence the diet, habitat selection, and demography of bighorn sheep, bison, moose, mule deer, and pronghorn. Elk browsing and nitrogen deposition can affect vegetative production, soil fertility, and plant diversity. Thus, changes in elk abundance over space and time can alter plant and animal communities in Yellowstone.

Bull elk grow antlers for the fall mating season and keep them through the winter. The antlers fall off for the new year's growth.

Description

Elk are the most abundant large mammal found in Yellowstone. European American settlers used the word "elk" to describe the animal, which is the word used in Europe for moose (causing great confusion for European visitors). The Shawnee word "wapiti," which means "white deer" or "white-rumped deer," is another name for elk. The North American elk is considered by some experts to be the same species as the red deer of Europe (*Cervus elaphus*). This is an ongoing taxonomic debate. Currently, most scientists refer to elk in North America as *Cervus canadensis*.

Due to their huge antlers, bull elk are one of the most photographed animals in Yellowstone. Bull elk begin growing their first set of antlers when they are about one year old. Antler growth is triggered in spring by a combination of two factors: a depression of testosterone levels and lengthening daylight. The first result of this change is the casting or shedding of the previous year's "rack." Most bulls drop their antlers in March and April. New growth begins soon after.

Growing antlers are covered with a thick, fuzzy coating of skin commonly referred to as "velvet." Blood flowing in the skin deposits calcium that makes the antler. Usually around early August, further hormonal changes signal the end of antler growth, and the bull begins scraping the velvet off, polishing and sharpening the antlers in the process.

The antler-growing period is shortest for yearling bulls (about 90 days) and longest for healthy, mature bulls (about 140 days). Roughly 70% of the antler growth takes place in the last half of the period, when the antlers of a mature bull will grow two-thirds of an inch each day. The antlers of a typical, healthy bull are 55–60 inches long, just under six feet wide, and weigh about 30 pounds per pair.

Bulls retain their antlers through the winter.

Quick Facts

Number in Yellowstone

- Summer: 10,000–20,000 elk in six to seven different herds.
- Winter: <2,000.

Where to See

- Summer: Cascade Meadows, Madison Canyon, and Lamar Valley.
- Autumn, during "rut" or mating season: northern range, including Mammoth Hot Springs; Madison River.
- Winter: migrate north to the northern range and around Gardiner, Montana; south to the Jackson Hole Elk Refuge in Jackson, Wyoming.

Size and Behavior

- Males (bulls) weigh ~700 pounds and are ~five feet high at the shoulder; females (cows) weigh ~500 pounds and are shorter; calves are ~30 pounds at birth.
- Bulls have antlers, which begin growing in the spring and usually drop in March or April of the following year.
- Feed on grasses, sedges, other herbs and shrubs, bark of aspen trees, conifer needles, burned bark, aquatic plants.
- Mating season (rut) in September and October; single calves born in May to late June.

Elk Antlers

Antlers are usually symmetrical and occur on males and, only rarely, females.

- The average, healthy, mature bull has six tines on each antler, and is known in some parts of the US as a "six point" or "six by six."
- One-year-old bulls grow 10–20-inch spikes, sometimes forked.
- Two-year-old bulls usually have slender antlers with four to five points.
- Three-year-old bulls have thicker antlers.
- Four-year-old and older bulls typically have six points; antlers are thicker and longer each year.
- Eleven- or 12-year-old bulls often grow the heaviest antlers; after that age, the size of antlers generally diminishes.

Horns vs. Antlers
Antlers, found on members of the deer family, grow as an extension of the animal's skull. They are true bone, are a single structure, and, generally, are found only on males. Horns, found on pronghorn, bighorn sheep, and bison, are a two-part structure. An interior portion of bone (an extension of the skull) is covered by an exterior sheath grown by specialized hair follicles (similar to human fingernails). Horns are usually found on both males and (in a diminutive form) females. Antlers are shed and regrown yearly while horns are never shed and continue to grow throughout an animal's life. One exception is the pronghorn, which sheds and regrows its horn sheath each year.

When antlered, bulls usually settle disputes by wrestling with their antlers. When antlerless, they use their front hooves (as cows do), which is more likely to result in injury to one of the combatants. Because bulls spend the winter with other bulls or with gender-mixed herds, retaining antlers means fewer injuries sustained overall. Also, bulls with large antlers that are retained longer are at the top of elk social structure, allowing them preferential access to feeding sites and mates.

Mating Season

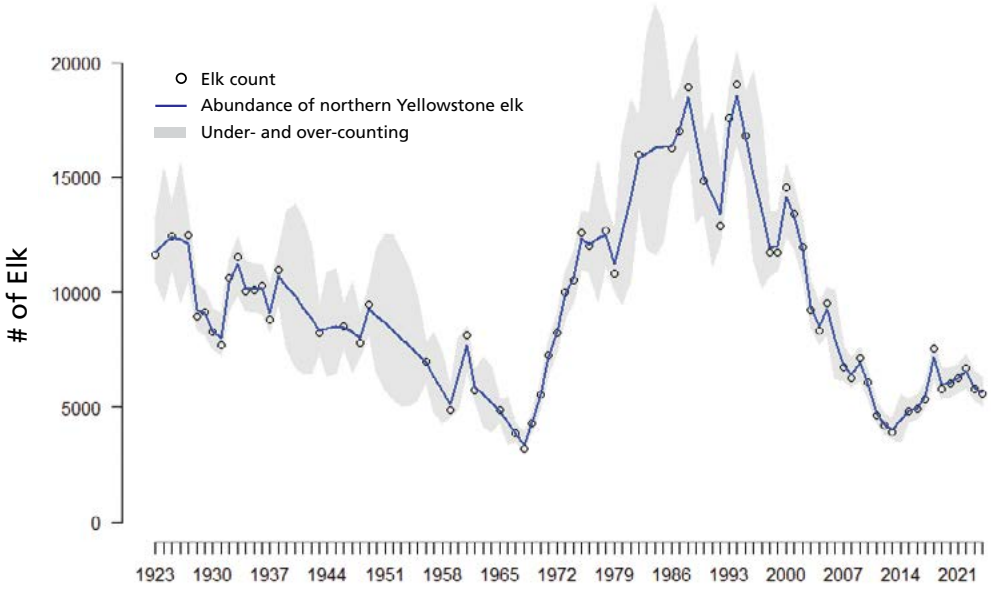
The mating season (rut) generally occurs from early September to mid-October. Elk gather in mixed herds—many females and calves, with a few bulls nearby. Bulls bugle to announce their availability and fitness to females and to warn and challenge other bulls. When answered, bulls move toward one another and sometimes engage in battle for access to the cows. They crash their antlers together, push each other intensely, and wrestle for dominance. While loud and extremely strenuous, fights rarely cause serious injury. The weaker bull ultimately gives up and wanders off.

Elk calves can walk within an hour of birth, but they spend much of their first week to 10 days bedded down between nursing sessions.

Calves are born in May and June. They are brown with white spots and have little scent, providing them with good camouflage from predators. They can walk within an hour of birth, but spend much of their first week to 10 days bedded down between nursing sessions. Soon after, they begin grazing with their mothers, and join a herd of other cows and calves. Up to two-thirds of each year's calves may be killed by predators. Elk calves are food for black and grizzly bears, wolves, coyotes, cougars, and golden eagles. Female elk can live 17–18 years. Rare individuals may live 25 years.

Population

The high elevation grasslands of the park provide summer habitat for 10,000–20,000 elk. However, fewer than 2,000 elk spend winter in the park. Climate is an important factor affecting the size and distribution of elk herds. Many ungulates migrate to increase their access to high-quality food. They prefer to feed on young plants, which are the most nutritious. In winter, colder temperatures and snowfall decrease the amount of forage that grows, which means less forage is accessible to wildlife. This forces elk to migrate to areas where forage is more available. The timing and routes of northern Yellowstone elk migration closely follow the areas of seasonal vegetation growth and changes in snow depth. After winters with high snowpack, elk delay migration. In years with lower snowpack and earlier vegetation



Abundance of the northern Yellowstone elk population, 1923–2024. Shaded area indicates uncertainty about the trend with respect to random under- and overcounting. These results underestimate the true population size because they do not account for imperfect sightability. Data from the Northern Yellowstone Cooperative Wildlife Working Group.

green-up, elk migrate earlier.

Ungulates that migrate typically give birth around periods of peak vegetation green-up to overlap with high-nutrition plant phases. Nutritious food allows mothers and calves to build up fat reserves. Changes in climate will undoubtedly impact newborn elk, but it is difficult to predict whether that impact will be positive or negative. Earlier spring could lead to a longer snow-free season where migration and access to food are not encumbered. However, a longer growing season, without increased access to high-quality forage, might have a negative impact. Warmer temperatures could increase the rate of green-up, causing the plants to complete their growth cycle faster, thus shortening the period of time that food is available and accessible. Also, earlier spring could result in a mismatch in the timing of calving and the date of peak plant nutrition, resulting in high mortality of newborn calves.

Elk on the northern range

Yellowstone's largest elk herd winters along and north of the park's winter boundary. With more moderate temperatures and less snowfall than the park interior, this area can support large numbers of wintering elk. The herd winters in the area of the Lamar and Yellowstone river valleys from Soda Butte to Gardiner, Montana. Currently, the majority of the northern herd migrates outside of the park into the Custer Gallatin National Forest and onto private land.

After decades of debate over whether this range was overgrazed by too many elk, public concern has shifted to the herd's small size. The winter count, which was approximately 17,000 when wolf reintroduction began in 1995, fell below 10,000 in 2003. It fluctuated between 6,000 and 7,000 as the wolf population on the park's northern range declined from 94 in 2007 to 50 by the end of 2015. The elk count dropped to 3,915 in early 2013, the lowest since culling ended in the park in the 1960s. However, the elk population has been increasing since 2013. There were more elk counted in 2022 (6,673) than during the final year of Gardiner Late Hunt (2010: 6,070) just north of the park's boundary. This hunt was initiated by the State of Montana in 1976 prior to carnivore recovery and designed to reduce the size of the northern herd through the removal of adult female elk. While these counts do not account for factors known to influence number of elk counted (e.g., snow cover, group size, sightability of elk across habitat types), these recent trends in minimum count estimates suggest herd size has stabilized or is even increasing. Decreased numbers have been attributed to large carnivore recovery (wolves, cougars, bears), hunter harvest, and drought-related effects on pregnancy and survival. The State of Montana has reduced the permits issued for this herd so that hunting of females now has little impact on population size.

There are some indications that elk–carnivore interactions are contributing to a release of willows and other woody vegetation from the effects of herbivory on the northern range. Carnivores play some role in altering elk behavior, group size, habitat selection, movements, and distribution; while the proportion of browsed aspen, cottonwood, and willow leaders has decreased in some areas during recent years, and

cottonwood and willow heights have increased significantly. Others argue that lower elk densities over the past two decades—resulting from the combined effects of predators (wolves, cougars, bears), human hunters, and weather—has necessarily altered the impact of elk browsing. Research is under way to determine the relative effects of climate, hydrology, carnivore predation/avoidance, and herbivory on these woody species.

A new book titled *Northern Yellowstone: Elk Resilience and Adaptation to Changes in Management Policies and the Ecosystem* is available for free download at **www.nps.gov/yell/ learn/nature/elk.htm**. This book, written by park biologists and colleagues, examines the history of elk conservation and management in the United States, compiles the latest scientific information about Yellowstone elk, and discusses both the opportunities for and challenges to elk conservation within the Greater Yellowstone Area and across their historic range.

Elk in the Interior

Only one herd lives both winter and summer inside the park. The Madison–Firehole elk herd (fewer than 100 animals) has been the focus of a research study since November 1991. Researchers are examining how environmental variability affects ungulate reproduction and survival. Prior to wolf restoration, the population was naturally regulated by severe winter conditions to a degree not found in other, human-hunted elk herds. The elk are also affected by high fluoride and silica levels in the water and plants they eat, which affect enamel formation and wear out teeth quickly—thus shortening their lives. The typical life span is 13 years; elk on the northern range regularly live to about 18 years. Information gained in this study will be useful in comparing non-hunted and hunted elk populations.

The Madison–Firehole herd is the only elk herd that lives inside the park in both winter and summer.

Elk in the Greater Yellowstone Ecosystem

The Greater Yellowstone Ecosystem is home to approximately 30,000–40,000 elk. For the last decade, the Jackson herd, which currently numbers about 10,000, has been larger than the northern Yellowstone herd. Some ranges and migratory routes overlap, and some interchange occurs among the herds. Summer range in the southern part of Yellowstone National Park is used by part of the Jackson herd as well as by elk from the North Fork Shoshone and northern Yellowstone herds. Because the wildlife responsibilities of the National Park Service, the US Fish and Wildlife Service, the US Forest Service, and state wildlife agencies coincide, elk management in Greater Yellowstone requires substantial coordination among government agencies with different priorities.

Disease in Greater Yellowstone

Brucellosis

Many elk and bison in the Greater Yellowstone Ecosystem have been exposed to the bacterium that causes brucellosis. Brucellosis is a contagious bacterial disease that originated in livestock and often causes infected cows to abort their first calves. It is transmitted primarily when susceptible animals directly contact infected birth material. No cure exists for brucellosis in wild animals. For more information about brucellosis, see "Bison."

The prevalence of brucellosis in Yellowstone elk is low; the rate of exposure to brucellosis in 100 adult female elk captured on the park's northern range during the winters of 2000 to 2005 was 2%; it was 3% in 130 neonatal elk on the park's northern range during the summers of 2003–2005; and it was 3% in 73 adult female elk captured in the park's Madison–Firehole drainages during the winters of 1996–1998. Elk are commonly observed within 100 yards of bison during late winter and spring when brucellosis-induced abortion or calving occurs in Yellowstone.

Because of their high densities, elk that are fed in winter have sustained high levels of brucellosis; winter feeding on the northern range stopped more than 50 years ago. Elk are fed during the winter at the National Elk Refuge in Jackson, Wyoming, in

addition to 22 Wyoming-run feed grounds. The feed grounds were created in the 1900s to maintain Wyoming's elk herds and limit depredation as migratory routes from summer range to lower elevation winter ranges became blocked by settlement in the Jackson area. Transmission of brucellosis from feed ground elk, where an average of 30% have tested positive for exposure to the bacteria, was the apparent source of infection in Wyoming cattle in 2004.

Chronic Wasting Disease

Elk, deer, and moose in and near Yellowstone National Park are at risk for infection by chronic wasting disease (CWD). This fatal infection, transmitted by animal contact or through the environment, has increasingly spread in Wyoming and Montana. Yellowstone National Park and the Wyoming Game and Fish Department confirmed the presence of CWD in the carcass of an adult mule deer buck found near Yellowstone Lake in the southeastern section of the park in October 2023. This is the first confirmed positive detection of the disease in Yellowstone National Park. National Park Service staff and partners will continue surveillance and, if necessary, take action to minimize both transmission of the disease and the effects of intervention on the elk population and other park resources.

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Staff Reviewer

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Moose

Yellowstone moose are the smallest of four subspecies of moose (*Alces alces shirasi*) in North America. Found in forested areas and willow flats from southeastern British Columbia to southern Colorado, they are better adapted to survival in deep snow than other ungulates in Greater Yellowstone. Except during the rut, moose are usually found alone or in small family groups. This behavior, and their use of habitat where they are often well concealed, impedes accurate estimates of population size and distribution.

Description

Moose are the largest members of the deer family in Yellowstone. Both sexes have long legs that enable them to wade into rivers and through deep snow, to swim, and to run fast. Moose, especially cows with calves, are unpredictable and have chased people in the park.

Moose are dark brown, often with tan legs and muzzle. Bulls have antlers for most of the year, or pedicles (flat bony protrusions on the skull) in the winter after antlers are cast. Females are distinguished from bulls without antlers by the white patch beneath their tail. Adults of both sexes have "bells"—a pendulous dewlap of skin and hair that dangles from the throat. Bulls urinate in wallows and lay down and splash in it spreading the scent all over them. The dewlap holds the scent that is then dispersed by the wind.

In summer, moose eat aquatic plants like water lilies, duckweed, and burweed. But the principle staples of the moose diet are the leaves and twigs of the willow, followed by other woody browse species such as gooseberry and buffaloberry. In winter when available, moose exhibit a high preference to subalpine fir. An adult moose consumes approximately 10–12 pounds of food per day in the winter and as much as 50 pounds of food per day in the summer.

Some moose that summer in the park migrate in winter to lower elevations west and south of Yellowstone where willow remains exposed above the snow. But many moose move to higher elevations (as high as 8,500 feet) to winter in mature stands of subalpine fir and Douglas-fir.

During the rut, both bulls and cows are vocal. Cows emit a drawn out groan in search of a mate, and bulls challenge one another with low guttural and repetitive grunts before clashing with their antlers. The weaker bull usually gives up before any serious damage is done; on rare occasions the opponent's antlers inflict a mortal wound.

Bulls usually shed their antlers in late December to late January, although young bulls may retain their antlers as late as March. Shedding their heavy antlers helps moose conserve energy and promotes easier winter survival. In April or May, bulls begin to grow new antlers. Small bumps called pedicles on each side of the forehead start to swell, then enlarge until

Bull moose usually shed their antlers in the beginning of winter to help conserve energy and survive winter.

Quick Facts

Number in Yellowstone

- Fewer than 200
- Population has declined in past 40 years due to loss of old-growth forests surrounding the park, hunting outside the park, burning of habitat, and predators.

Where to See

- Marshy areas of meadows, lake shores, and along rivers.

Behavior and Size

- Adult male (bull) weighs close to 1,000 pounds; female (cow) weighs up to 900 pounds; 5½ to 7½ feet at the shoulder. Young weigh 25–35 pounds at birth.
- Usually alone or in small family groups.
- Mating season peaks in late September and early October; one or two calves born in late May or June.
- Lives up to 20 years.

they are knobs covered with a black fuzz (called velvet) and fed by blood that flows through a network of veins. Finally, the knobs change into antlers and grow until August. The antlers are flat and palmate (shaped like a hand). Yearlings grow six- to eight-inch forked antlers; prime adult bulls usually grow the largest antlers—as wide as five feet from tip to tip. When the antlers reach their full size, the bull rubs his antlers on small trees and brush to remove the velvet and polish the antlers in preparation for the rut. Cows breed in early fall; gestation is approximately eight months. Cows most commonly give birth to a single calf in Yellowstone.

Population

Moose appear to have been scarce in Yellowstone until the latter half of the 1800s and in Jackson Hole until the early 1900s. The first documented report of a moose on the northern range was 1913. Predator-control programs, forest-fire suppression, and restrictions on moose hunting contributed to their subsequent range expansion and increased numbers.

Forest-fire suppression was probably the most important factor in moose population increase because moose in Greater Yellowstone depend on mature spruce/fir forests for winter survival, unlike other North American moose populations that prefer large willow flats or shrubland that has been created by events like fires or logging.

The Yellowstone moose population has declined from roughly 1,000 in the 1970s to about 200 in 1996 (the most recent data), with the northern range population down by at least 75% since the 1980s. The population declined steeply following the fires of 1988 that burned mature fir forests. Many old moose died during the winter of 1988–89, probably as a combined result of the loss of good moose winter forage and a harsh winter. Large populations of elk and bison, which also browse willow, likely reduce the amount of willow forage available for moose. Unlike moose habitat elsewhere, northern Yellowstone does not have woody browse species that will come in quickly after a fire and extend above the snowpack to provide winter food.

Recent studies south of the park also suggest that fire on the summer ranges of migratory moose is partially responsible for the population decline. The population of moose that uses burned areas is declining more rapidly than the portion of the population that forages in unburned areas.

Predation of moose calves by bear and wolf populations may be limiting population growth, but the low pregnancy rates of greater Yellowstone moose suggest limits set by food availability. Long-term studies suggest that North American moose populations tend to erupt, crash, and then stabilize for a time.

Montana has noted a state-wide decline in moose populations. Moose hunting in the districts immediately north of Yellowstone has been limited to antlered bulls since 1996. Only two permits were issued in those districts in 2014. In 2012, Montana Fish, Wildlife and Parks began a study to assess and monitor the population across the state. A three-year northern Yellowstone National Park moose study was completed between the winters of 2013–2014 and 2015–2016 with the main objective to estimate population abundance and vital statistics of northern Yellowstone moose. Population modelling based on fecal DNA estimated between 150 and 186 moose occupied northern Yellowstone between 2013 and 2015 and that the annual population growth rate is 4%, (considered moderate growth). However, because mature conifer forest (important wintering habitat) were reduced by the 1988 fires and large populations of elk and bison compete with moose for willow browse, northern YNP moose will likely persist at a low density. Today, moose are most likely seen in the park's southwestern corner and in the Soda Butte Creek, Pelican Creek, Lewis River, and Gallatin River drainages.

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Deer

The Greater Yellowstone Ecosystem is home to both mule deer (*Odocoileus hemionus*) and white-tailed deer (*Odocoileus virginianus*). The mule deer, also called blacktail deer, is an exclusively western species commonly seen in open-brush country throughout the western states. Widely dispersed throughout Yellowstone National Park during the summer, mule deer migrate seasonally, and most of the population winters outside of the park. Although the white-tailed deer is the most common deer species throughout North America, it has never been abundant in Yellowstone. This may be due to habitat and elevation constraints on the northern range or competition from other ungulates that are better suited to park habitat. The two species are differentiated by their antler shape and tail size and appearance.

Behavior

All species of deer use their hearing, smell, and sight to detect predators such as coyotes, cougars, or wolves. They probably smell or hear the approaching predator first, then may raise their heads high and stare hard, rotating ears forward to hear better. If a deer hears or sees movement, it flees.

Population

In 2018, aerial surveys detected 1,996 mule deer in the Gardiner Basin area and across the northern range of Yellowstone Park. This was the highest population count since 2009, and above the ten-year average of 1,901. Deer population numbers have increased each year since a low in 2012 following a severe winter. In 2018, recruitment was 29 fawns per 100 adults, lower than the long-term average of 41 fawns per 100 adults. This likely reflects fawn mortality from harsh winter conditions during 2017–18 on mule deer range in and outside Yellowstone National Park.

While the relative distribution of mule deer across their winter range has remained similar over the past two decades, the population appears to cyclically increase and decrease. Mule deer populations may decline during severe winters, when deep snow and extremely cold temperatures make foraging difficult, thereby increasing starvation and predation susceptibility.

Although researchers estimate that northern Yellowstone has a summer mule deer population

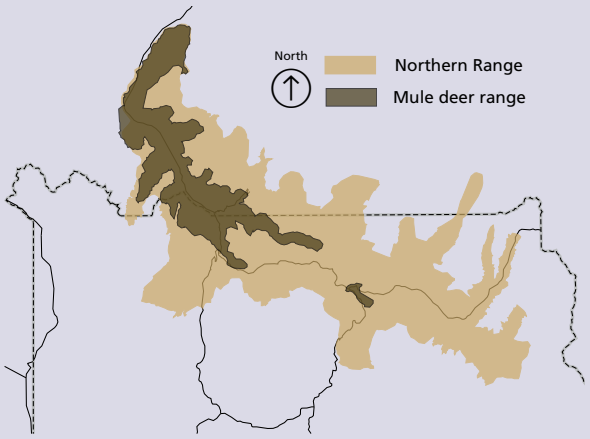
Mule Deer

Number in Yellowstone
Summer: 1,850–1,900; winter: fewer than 400

Where to See
Summer: throughout the park; Winter: North Entrance area.

Size and Behavior

- Male (buck): 150–250 pounds; female (doe): 100–175 pounds; 3½ feet at the shoulder.
- Summer coat: reddish; winter coat: gray-brown; white rump patch with black-tipped tail; brown patch on forehead; large ears.
- Males grow antlers from April or May until August or September; shed them in late winter and spring.
- Mating season (rut) in November and December; fawns born late May to early August.
- Lives in brushy areas, coniferous forests, grasslands.
- Bounding gait, when four feet leave the ground, enables it to move more quickly through shrubs and rock fields.
- Eats shrubs, forbs, grasses; conifers in spring.
- Predators include wolves, coyotes, cougars, and bears.



Mule deer winter range lies primarily north of the park boundary.

of 1,850 to 1,900, fewer than several hundred stay in the park all winter. Unlike elk and bison, many of which remain in the park throughout the year, mule deer are preyed upon by wolves, coyotes, cougars, and bears in the park mostly in the summer. Because of the mule deer's seasonal distribution, the relative scarcity of white-tailed deer, and the abundance of elk, which are the main prey of wolves, wolf recovery in Yellowstone is believed to have had little effect on deer populations and recruitment.

Although the primary causes of deer mortality are winter kill and predation, mule deer and white-tailed deer outside the park are subject to state-regulated harvesting in the fall. Because of their scarcity, little is known about the white-tailed deer that inhabit the northern range, and the population within the park is not monitored.

In 2024, chronic wasting disease (CWD) was detected in a radio collared male (buck) mule deer from Wyoming that migrated into the southeast portion of Yellowstone. National Park Service staff and partners will continue surveillance and, if necessary, take action to minimize transmission of the this disease.

White-tailed Deer

Number in Yellowstone
Scarce, not monitored

Where to See
Along streams and rivers in the northern range.

Size and Behavior

- Adults 150–250 pounds; 3½ feet at the shoulder.
- Summer coat: red-brown; winter coat: gray-brown; throat and inside ears with whitish patches; belly, inner thighs, and underside of tail white.
- Waves tail like a white flag when fleeing.
- Males grow antlers from May until August; shed them in early to late spring.
- Mating season (rut) peaks in November; fawns born usually in late May or June.
- Eats shrubs, forbs, grasses; conifers in spring.
- Predators include wolves, coyotes, cougars, and bears.

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Pronghorn

The North American pronghorn (*Antilocapra americana*) is the surviving member of a group of animals that evolved in North America during the past 20 million years. It is not a true antelope, which is found in Africa and southeast Asia. The use of the term "antelope" seems to have originated when the first written description of the animal was made during the 1804–1806 Lewis and Clark Expedition.

Description

The pronghorn has true horns made of modified, fused hair that grows over permanent bony cores. Their horns differ from those of other horned animals in two major ways: the sheaths are shed and grown every year, and they are pronged. (A number of other horned mammals occasionally shed their horns, but not annually.) Adult males typically have 10–16-inch horns that are curved at the tips. About 70% of the females also have horns, but theirs average one to two inches long and are not pronged. The males usually shed the horny sheaths in November or December and begin growing the next year's set in February or March. The horns reach maximum development in August or September. Females shed and regrow their horns at various times.

Pronghorn are easy to distinguish from the park's other ungulates. Their deer-like bodies are reddish-tan on the back and white underneath, with a large white rump patch. Their eyes are very large, which provides a large field of vision. Males also have a black cheek patch.

Pronghorn evolved in North America 20 million years ago. They can run sprints at 45–50 miles per hour, an adaptation to outrun an extinct cheetah.

Behavior

Females that bred the previous fall commonly deliver a set of twins in May or June. The newborn fawns are uniform grayish-brown and weigh six to nine pounds. They walk within 30 minutes of birth and are capable of outrunning a human in a couple of days. The young normally stay hidden in the vegetation while the mother grazes close by. After the fawns turn three weeks old, they begin to follow the females as they forage. Several females and their young join together in nursery herds, along with yearling females.

For increased protection against predators, pronghorn form groups. When one individual detects danger, it flares its white rump patch, signaling the others to flee. The pronghorn is adapted well for outrunning its enemies—its oversized windpipe and heart allow

Quick Facts

Number in Yellowstone
500–600 as of Spring 2025.

Where to See

- Summer: Lamar Valley; some may be near the North Entrance at Gardiner, Montana.
- Winter: between the North Entrance and Reese Creek.

Behavior and Size

- Male (buck) weighs 100–125 pounds; female (doe) weighs 90–110 pounds; adult length is 45–55 inches and height is 35–40 inches at shoulder.
- Average life span: 7–10 years.
- Young (fawns) born in late May–June.
- Live in grasslands.
- Can run for sustained sprints of 45–50 mph.
- Eat sagebrush and other shrubs, forbs, some grasses.
- Both sexes have horns; males' horns are pronged.

History

- Prior to European American settlement of the West, pronghorn population estimated to be 35 million.
- Early in the 1800s, pronghorn were abundant in river valleys radiating from Yellowstone; settlement and hunting reduced their range and numbers.
- Park management also culled pronghorn during the first half of the 1900s due to overgrazing concerns.

Management Concerns

- Pronghorn are a species of special concern in the park.
- This small population could face extirpation from random catastrophic events such as a severe winter or disease outbreak.

large amounts of oxygen and blood to be carried to and from its unusually large lungs. Pronghorn can sustain sprints of 45–50 mph. Such speed, together with keen vision, make the adults difficult prey for any natural predator. Fawns, however, can be caught by coyotes, bobcats, wolves, bears, and golden eagles.

The pronghorn breeding season begins mid-September and extends through early October. During the rut, the older males "defend" groups of females (called a harem). They warn any intruding males with loud snorts and wheezing coughs. If this behavior does not scare off the opponent, a fight may erupt. The contenders slowly approach one another until their horns meet; then they twist and shove each other. Eventually, the weaker individual will retreat. Although the fights may be bloody, fatalities are rare.

The most important winter foods are shrubs like sagebrush and rabbitbrush; pronghorn eat succulent forbs during spring and summer. They can eat lichens and plants such as locoweed, lupine, and poisonvetch that are toxic to some ungulates. Their large liver (proportionately, almost twice the size of a domestic sheep's liver) may be able to remove plant toxins from the bloodstream. Grasses appear to be the least-used food item, but may be eaten during early spring when the young and tender shoots are especially nutritious.

During winter, pronghorn form mixed-sex- and -age herds. In spring, they split into smaller bands of females, bachelor groups of males between one and five years old, and solitary older males. The small nursery and bachelor herds may forage within home ranges of 1,000 to 3,000 acres while solitary males roam smaller territories (60 to 1,000 acres in size). Pronghorn, including three-fourths of the individuals in Yellowstone, migrate between different winter and summer ranges to more fully utilize forage within broad geographic areas.

Reduction of pronghorn winter range north of the park through development by private land owners, likely contributed to populations declines in the 1990s.

Pronghorn fawns are very vulnerable to predation in their first half-hour of life. However, within two days of birth, fawns can outrun a human being, and they pick up speed as they grow.

Population

During the early part of the 1800s, pronghorns ranked second only to bison in numbers, with an estimated 35 million throughout the West. The herds were soon decimated by conversion of rangeland to cropland, professional hunters who sold the meat, and ranchers who believed that pronghorns were competing with livestock for forage. Today, due to transplant programs and careful management, pronghorns roam the sagebrush prairies in herds totaling nearly 500,000 animals.

The pronghorn's population fluctuations on the northern range show the effects of management interventions as well as natural shifts in forage availability, competition with elk, and predation. Efforts to keep pronghorn in the park with fences and winter feeding reduced their abundance and use of migratory routes by the 1920s, and about 1,200 pronghorn were removed from 1947 to 1967 to address perceived sagebrush degradation. Complaints about crop depredation led to the removal of about 190 pronghorn on private land from 1985 to 2002. The reason for the sudden population decline in the early 1990s remains unclear, but fawn survival appears to have been low. This was probably due to coyote predation and reduction of winter range north of the park through development by private land owners. Pronghorn winter range inside the park is former agricultural land infested with nonnative vegetation of low nutritional quality.

Since the mid 2000s, the pronghorn population has seen a steady rebound in population, and since 2012, the population has recovered to the highest population estimates since the early 1990s. Removal of fences and better forage availability in areas adjacent to Yellowstone National Park appear to have reduced predation factors on pronghorn on the winter range, and those are some of the factors attributed to increases in pronghorn numbers. Outside Yellowstone National Park, a limited pronghorn hunt was re-established in response to population increases beginning in 2016. Since the early 2000s, evidence of migration and dispersal into Paradise Valley as well as mixing with pronghorn herds outside the park, indicate long-term viability of the Yellowstone population. Research continues to search for answers concerning the Yellowstone pronghorn herd. This small population continues to be susceptible to extirpation from random catastrophic events, such as a severe winter or disease outbreaks.

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Wolves

Although wolf packs once roamed from the Arctic tundra to Mexico, loss of habitat and extermination programs led to their demise throughout most of the United States by the early 1900s. In 1973, the US Fish and Wildlife Service (USFWS) listed the northern Rocky Mountain wolf (*Canis lupus*) as an endangered species and designated Greater Yellowstone Ecosystem (GYE) as one of three recovery areas. From 1995 to 1997, 41 wild wolves from Canada and northwest Montana were released in Yellowstone. As expected, wolves from the growing population dispersed to establish territories outside the park, where they are less protected from human-caused mortalities. The park helps ensure the species' long-term viability in GYE and has provided a place for research on how wolves may affect many aspects of the ecosystem. January 12, 2025, marked the 30th anniversary since wolves returned to Yellowstone.

Members of the Delta pack, November 2013.

Description

In the years following wolf restoration, the population grew rapidly as newly formed packs established territories with sufficient prey. Over time, the wolves expanded their range and are now found throughout the Greater Yellowstone Ecosystem (GYE). Since 2009, Yellowstone's wolf population has stabilized following a decline from the initial recolonization period. This decrease has been most pronounced in northern range packs, primarily due to declines in the elk population and limited available territory. Disease outbreaks have also contributed to the decline.

Wolves are highly adaptable predators with remarkable physical characteristics. Adult males in Yellowstone average 110 pounds (50 kg), while females weigh around 90 pounds (41 kg), with the heaviest known Yellowstone wolf weighing 148 pounds. Standing approximately 81 cm (males) and 77 cm (females) tall at the shoulder, wolves average 181 cm in length. Their eyes, blue at birth, change to shades of light yellow, gold, or brown in adulthood. Wolves have 319 bones in males and 318 in females, along with 42 teeth designed for a carnivorous diet. Their dental formula includes 3 incisors, 1 canine, 4 premolars, and 2–3 molars on each side.

Wolves have dense, typically gray or black pelage. As tetrapedal digitigrades, wolves are built for endurance and speed, traveling an average of 5 mph (8 kph) but capable of sprinting up to 35 mph (56 kph). Their physiology supports their active lifestyle, with a body temperature of 100–102.5°F (37.3–39.1°C), a resting respiration rate of 10–30 breaths per minute, and a

Quick Facts

Number

- In 2025, there were at least 84 wolves in the park. Eight packs were noted. Wolves in YNP sit at the core of a larger population connected throughout the Greater Yellowstone Ecosystem.
- In general, wolf numbers have fluctuated between 83 and 123 wolves since 2009.

Where to See

- They inhabit most of the park; peak activity is at dawn and dusk.
- The northern range of Yellowstone is one of the best places in the world to watch wolves.

Size and Behavior

- 26–36 inches tall at the shoulder, 4–6 feet long from nose to tail tip; males weigh 100–130 pounds, females weigh 80–110 pounds.
- Home range within the park is 185–310 square miles (300–500 km^2); varies with pack size, food availability, and season.
- Average lifespan in the park is four to five years, average outside is two to three years. The oldest known wolf here was 12.5 years old.
- Two main color variations exist in Yellowstone in approximately equal proportions: black and gray.
- Prey primarily on hoofed animals. In Yellowstone, 90% of winter diet is elk; summer prey consist of more deer and smaller mammals.
- Mate in February; give birth to average of five pups in April after a gestation period of 63 days; young emerge from den at 10–14 days; pack remains at the den for three to ten weeks unless disturbed.
- Leading cause of death for wolves within the park is death by other wolves; leading cause of death for wolves outside the park is human-caused.

Wolves (back) are larger than coyotes (middle) and red foxes (front).

Yellowstone wolves are predominantly colored gray or black (top photo). Coat color can also be influenced by age as shown by long-term dominant female of Canyon pack who turned from gray to almost white with age (lower left) and 10-yr old Canyon dominant male 712M who turned from dark black to light silver with age (lower right).

heart rate of 70–120 beats per minute. Equipped with a powerful bite pressure of 1,200 psi, wolves are well-suited to capture and consume large prey, showcasing their vital role in Yellowstone's ecosystem.

Genetics

Since their reintroduction, genetic studies have examined Yellowstone wolves' genetic health, pack kinship, connectivity with other Northern Rocky Mountain populations, and genes linked to physical and behavioral traits. One notable finding involves coat color: about half of Yellowstone wolves are black, while the other half are primarily gray. The black coat results from a single mutation in the K-locus gene (CBD103), which likely originated from hybridization with domestic dogs brought to North America via the Bering Land Bridge within the last 7,000 years.

In addition to influencing coat color, the K-locus gene is linked to immune function. Black wolves, for example, show higher survival rates during distemper outbreaks. Research also indicates behavioral and reproductive differences: gray wolves tend to be more aggressive in territorial conflicts and achieve higher reproductive success, while black and gray wolves preferentially mate with individuals of the opposite coat color. These findings suggest a fitness trade-off between coat colors, contributing to the persistence of black wolves in Yellowstone's population.

Diet

Wolves consume a wide range of prey, efficiently hunting large animals that many other predators cannot. In Yellowstone, elk make up 90% of their winter diet, while deer account for 10–15% of their summer prey. Wolves also kill bison, an increasingly important food source.

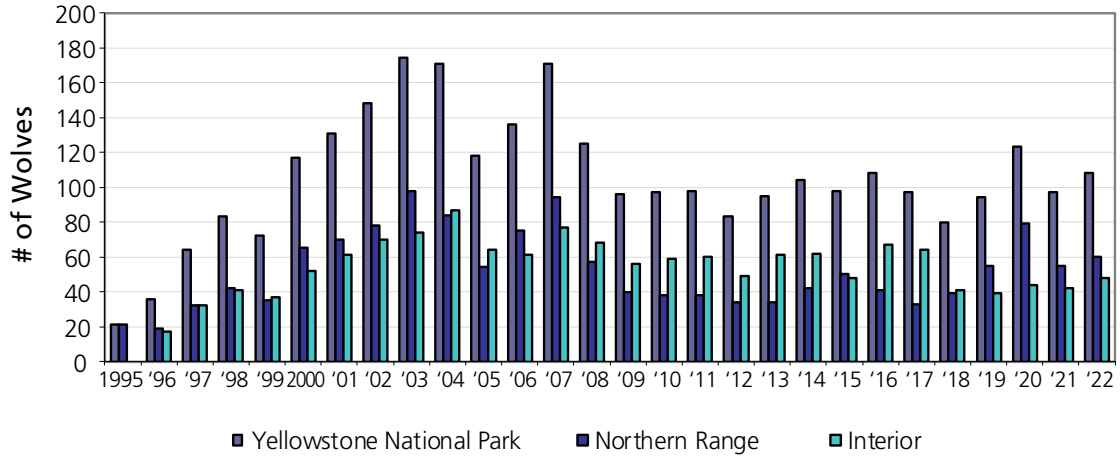
Wolf kills provide vital resources for many other animals. Ravens and magpies arrive almost immediately after a kill, followed by coyotes, which wait nearby until the wolves are finished. Bears often chase wolves off their kills and claim the remains. Eagles, invertebrates, and other scavengers also benefit.

From 1995 to 2000, elk calves made up 50% of early winter wolf prey, while bull elk comprised 25%. Between 2001 and 2007, this ratio reversed, reflecting shifts in prey vulnerability and availability. While predation on bison occurs across all age groups, wolves primarily scavenge bison that die during winter or

Interesting Wolf Behavior

Wolves kill each other and other carnivores, such as coyotes and cougars, usually because of territory disputes or competition for carcasses. In 2000, however, the subordinate female wolves of the Druid pack exhibited behavior never seen before: they killed their pack's alpha female; then they carried her pups to a central den and raised them with their own litters.

In 2019, a subordinate female wolf of the Junction Butte pack killed the pups of the pack's alpha female; then the rest of the pack raised the subordinate female's pups.



Yellowstone National Park wolf population, 1995–2022.

from injuries sustained in the breeding season.

These findings underscore the importance of long-term monitoring to understand predator–prey dynamics. Wolf predation patterns are influenced by multiple factors, including competition with other predators, ungulate management outside the park, and weather conditions like drought and winter severity. Such factors affect forage quality and elk nutritional condition, ultimately shaping prey selection and kill rates over time.

Disease

Disease has periodically impacted the population, particularly pups and older adults. Canine distemper outbreaks occurred in 2005, 2008, and 2009, with the 2005 outbreak killing two-thirds of the park's pups. Other diseases, such as infectious canine hepatitis, canine parvovirus, and bordetella, have been confirmed, though their effects on mortality remain unclear.

In 2009, sarcoptic mange, caused by the mite *Sarcoptes scabiei*, reached epidemic levels among northern range wolves. Transmitted through direct contact, the mites burrow into the skin, triggering intense itching, hair loss, and secondary infections. By late 2011, the epidemic had largely subsided, but the infection persists at lower levels across the park.

History of Wolf Management

Wolves have been a vital part of North America's ecosystems for thousands of years, ranging from the Arctic tundra to forests, grasslands, and deserts. Once widespread across the continent, they played a key role as apex predators, maintaining the balance of prey populations and supporting biodiversity. However, due to habitat loss, hunting, and government eradication programs, wolves were nearly eliminated from most of their historical range by the mid-20th century. Conservation efforts, including reintroduction programs, have since helped restore wolf populations in select areas, highlighting their ecological and cultural significance.

Early Wolf Management

In the 1800s, westward expansion brought settlers and livestock into direct conflict with native predators like wolves. As agriculture expanded, much of the wolves' prey was wiped out, leading them to target livestock. In response, humans launched widespread eradication efforts, including poisoning, which eliminated wolves from most of their historical range. Even within Yellowstone, predator control measures in the late 1800s and early 1900s targeted wolves, bears, cougars, and coyotes to protect

Ranger Ted Ogsten and Chief Ranger Sam Woodring with coyote pelts, 1927.

Canadian and American wildlife biologists captured wolves in Canada and relocated and released them in both Yellowstone and central Idaho. Wolves were temporarily penned before their release.

livestock and "desirable" wildlife like deer and elk.

When Yellowstone was established in 1872, gray wolves were present. The fossil record also shows their presence in the region going back thousands of years. However, early park managers, lacking an understanding of ecosystems, viewed wolves as destructive predators. Between 1914 and 1926, at least 136 wolves were killed in the park, and by the 1940s, wolf packs were nearly extinct in the area. By the mid-20th century, wolves were virtually eliminated from the lower 48 states.

An intensive survey in the 1970s found no evidence of a wolf population in Yellowstone. Occasional sightings occurred, such as a wolf-like canid filmed in Hayden Valley in 1992, but no breeding pairs were confirmed. During the 1980s, wolves began to reestablish breeding packs in northwestern Montana, with 50–60 wolves reported by 1994.

In the 1960s, National Park Service (NPS) wildlife management policies shifted to let populations manage themselves, emphasizing the importance of predators like wolves. Growing national awareness of environmental issues led to laws like the 1973 Endangered Species Act (ESA), requiring the restoration of endangered species. By 1978, all wolf subspecies except those in Minnesota were federally listed as endangered, aligning with NPS policy to restore native species where feasible.

Restoration Efforts

In 1987, the USFWS Northern Rocky Mountain Wolf Recovery Plan proposed reintroducing an "experimental population" of wolves into Yellowstone. Under section 10(j) of the Endangered Species Act, experimental populations are nonessential, allowing greater management flexibility. Scientists predicted wolves would have minimal effects on mule deer, pronghorns, bighorn sheep, white-tailed deer, or bison, with minor impacts on grizzly bears and cougars. They expected wolves to reduce coyote numbers and increase red fox populations.

In 1991, Congress funded the USFWS to prepare an Environmental Impact Statement (EIS) on wolf restoration, in consultation with the NPS and US Forest Service. After extensive public input, the Secretary of the Interior signed the Record of Decision in June 1994, approving gray wolf reintroduction to Yellowstone and central Idaho.

Although a five-year reintroduction plan was anticipated, no transplants were needed after 1996 due to the program's early success. Some expressed concerns about wolves becoming habituated to humans while in pens, but confinement reinforced their natural avoidance of people, as it was a negative experience for them.

Relocation and Release

In late 1994, early 1995, and again in 1996, USFWS and Canadian wildlife biologists captured wolves in Canada and relocated them to Yellowstone and central Idaho. In January 1995, 14 wolves were temporarily penned in Yellowstone: eight arrived on January 12 and six more on January 19. Each social group was kept together in acclimation pens. A second group of 17 wolves arrived in January 1996, with 11 brought on January 23 and six more on January 27. The wolves, ranging in age from nine months to five years and weighing 72–130 pounds, included individuals known to hunt bison and included breeding adults and younger pack members.

Each wolf was fitted with a radio collar before relocation. While penned, wolves were fed twice weekly with elk, deer, moose, or bison carcasses and had minimal contact with humans. Law enforcement rangers guarded the pens, and the surrounding areas were closed to visitors to prevent unauthorized access. Biologists monitored the wolves' welfare twice weekly using telemetry or visual observation during feedings.

Although a five-year reintroduction plan was anticipated, no transplants were needed after 1996 due to the program's early success. Some expressed concerns about wolves becoming habituated to humans while in pens, but confinement reinforced their natural avoidance of people, as it was a negative experience for them.

Restoration Results

Preliminary studies indicated that wolf recovery was likely to enhance biodiversity in the Greater Yellowstone Ecosystem (GYE). Wolves primarily prey on elk, with their kills benefiting a variety of scavengers. They are also increasingly preying on bison in late winter, though most bison biomass consumed comes from scavenging carcasses of bison that died naturally. Grizzly bears frequently usurp wolf kills, providing bears with a crucial food source in low-food years—contrary to expectations based on other regions. Additionally, wolf aggression toward coyotes has reduced their numbers in wolf territories, likely benefiting smaller predators, rodents, and birds of prey.

Wolves have contributed to decreased survival rates of elk calves and older female adults while also influencing elk habitat use. These effects, while partly predictable, are more complex in Yellowstone's ecosystem, which features multiple large predators—grizzly bears, black bears, coyotes, and cougars—as well as human hunting outside the park. This complexity makes it challenging to project long-term elk population trends.

The impact of wolves on northern Yellowstone elk dynamics cannot be generalized across the GYE. Variations depend on factors like elk densities, predator abundance, alternative prey availability, winter severity, and human influences such as hunting and livestock interactions. A coalition of professionals and researchers is studying additional wolf-ungulate systems in the western GYE. Findings suggest that wolf predation's effects on elk range from significant to minimal, depending on the specific context.

Legal Challenges

Several lawsuits were filed to halt wolf restoration, citing various concerns. The cases were consolidated, and in December 1997, a judge ruled that the reintroduction program in Yellowstone and central Idaho violated section 10(j) of the Endangered Species Act. The ruling found insufficient geographic separation between fully protected wolves in Montana and the reintroduction areas, where special management rules applied. The judge, expressing "utmost reluctance," ordered the removal—but not the killing—of reintroduced wolves and their offspring. However, he stayed the order pending appeal. The Justice Department appealed, and in January 2000, the decision was reversed, allowing the wolf reintroduction program to continue.

Wolf Management Timeline

- Late 1800s–early 1900s: predators, including wolves, are routinely killed in Yellowstone.
- 1926: The last wolf pack in Yellowstone is killed, though single wolves are occasionally reported after.
- 1974: The gray wolf is listed as endangered; initiating recovery efforts under the Endangered Species Act.
- 1975: Efforts to restore wolves in Yellowstone begin.
- 1991: Congress allocates funding for an environmental impact study (EIS) on wolf recovery.
- 1994: EIS for wolf reintroduction completed with over 160,000 public comments, the largest at the time for any federal proposal.
- 1995 and 1996: 31 gray wolves from western Canada relocated to Yellowstone.
- 1997: 10 wolves from northwestern Montana relocated to Yellowstone National Park; a court orders their removal, but the decision is stayed pending appeal (reversed in 2000).
- 1995–2003: Wolves kill significantly fewer livestock than expected: 256 sheep and 41 cattle.
- 2005: Wolf management is transferred from the federal government to Idaho and Montana.
- 2008: Wolves in Montana, Idaho, and Wyoming are delisted, then relisted.
- 2009: U.S. Fish and Wildlife Service (USFWS) delists wolves in Montana and Idaho, but not Wyoming; a legal challenge relists the Northern Rocky Mountain wolf population.
- 2011: Wolves in Montana and Idaho are delisted by Congress, and USFWS proposes delisting in Wyoming.
- 2012: Wolves in Wyoming are delisted under a Congressional directive.
- 2014: Wolves are relisted in Wyoming.
- 2017: Wolves are delisted in Wyoming, and the Northern Rocky Mountain wolf population is no longer listed as endangered.
- April 26, 2017 (current status): Wolves are delisted in Montana, Idaho, and Wyoming.
- January 4, 2021: All gray wolves in the lower 48 states removed from the list of species protected under the ESA.

Legal Status

The biological requirements for delisting wolves from the Endangered Species Act (ESA) were met with at least 300 wolves and 30 breeding pairs sustained for three consecutive years across three recovery areas. In 2008, the USFWS delisted wolves in Idaho, Montana, and Yellowstone and Grand Teton national parks after approving management plans in Idaho and Montana. However, lawsuits from environmental groups successfully argued that Wyoming's wolf management plan was inadequate and that genetic connectivity between recovery areas was not established. As a result, wolves were relisted as endangered.

In 2009, wolves were delisted again in Montana and Idaho, though not in Wyoming. Legal challenges led to the Northern Rocky Mountain wolf population being relisted under the ESA. In 2011, Congress delisted wolves in Montana and Idaho, and in 2012 directed the USFWS to reissue its 2009 delisting rule, contingent on Wyoming developing an approved regulatory framework. On September 30, 2012, wolves in Wyoming were delisted and managed under the state's plan, but litigation led to their relisting on September 23, 2014. Following an appeal, wolves in Wyoming were delisted again on April 25, 2017, and are now managed under regulated hunting seasons in Montana, Wyoming, and Idaho.

The USFWS continues to monitor wolf populations in Montana and Idaho for at least five years post-delisting, with the option to relist or emergency relist if necessary. Wolves are now managed by state, Tribal nations, and federal agencies, with management in national parks and wildlife refuges guided by existing legislation and regulations.

The Future of Wolf Management

The future of wolves in the GYE will largely depend on the management of livestock depredation, wolf hunting outside the park, and the social acceptance of coexisting with wolves. Wolf populations will also be influenced by the availability of prey species such as elk, deer, and bison, which fluctuate due to hunting quotas, winter severity, and disease. The extent to which wolves have contributed to the decline of the northern Yellowstone elk population since the mid-1990s—and the potentially related resurgence of willow and aspen in some areas—remains an active area of research.

Wolf Management

Wolf management in Yellowstone involves strategies for both the short and long term. Over time, we keep track of the wolf population to learn how they live, interact with each other, and affect other wildlife. To do this, we use tools like radio collars, remote cameras, sound recordings, and direct observations. This research helps us make decisions about managing the park's natural resources, create educational programs, and work with other agencies and groups interested in wildlife management.

Our Goals

- **We study wolves to understand how they behave as individuals, how they interact within and between packs, and how they influence the ecosystem as apex predators.** Bringing wolves back to Yellowstone after nearly 70 years is a major conservation success. Our monitoring and research gives us valuable insights into their population health, social behavior, interactions with prey, relationships with other predators, and impact on the food web.
- **We work to ensure wolves stay wild.** In the park, we manage roadside carcasses, temporarily close areas near wolf dens, and ensure wolves don't access human food. Outside the park, we share information with wildlife agencies and others to help manage issues like state-managed wolf hunting near the park and conflicts between wolves, humans, or livestock.
- **We provide educational opportunities for the public to understand and appreciate wild wolves in their natural habitat.** Yellowstone is one of the best places in the world to see wild wolves. We teach visitors how to watch wolves safely to avoid disturbing them and to protect both wolves and people. Our research, monitoring, and education efforts help create a world-class experience for visitors to watch and learn about wolves.

Long-Term Monitoring & Research

Long-term monitoring and research are vital for managing wildlife because ecosystems and species relationships are always changing. Since wolves were reintroduced to Yellowstone in 1995, we've collected long-term data to gain valuable insights about them. We gather much of this information by tracking

wolves with radio collars. We also use noninvasive tools like sound recordings and remote cameras to better understand wolf behavior and their role in the ecosystem.

Wolf Capture

We track most wolf packs by fitting some individuals with radio collars during winter capture efforts, usually done using helicopters with darting or net-gunning techniques. These collars can be GPS (global positioning system) collars, which send daily location data via satellite, or VHF (very high frequency) collars, which are tracked from the ground or air. We aim to collar about 30% of each pack to account for losses due to wolf deaths, collar failures, or wolves leaving to join or form new packs inside or outside the park. We focus on collaring key wolves, like breeders and pups, and replacing older or failed collars. During captures, we collect blood samples, record weight and body measurements, and determine the wolf's sex and age. This radio-collared population, combined with monitoring data, supports long-term research, guides management actions in the park, and helps with decisions within and beyond Yellowstone's boundaries.

Genetics & Disease

Yellowstone collects DNA samples from all wolves we handle or find deceased to create genetic profiles. These profiles help us study how wolves evolve, maintain population health, and relate to one another. They also show how genetic traits influence their appearance, behavior, survival, and reproduction. Using this data, we estimate relationships within and between packs, including parentage and sibling ties. This helps us track reproduction and identify wolves moving in or out of the park—important for understanding population health and long-term survival. We also use hair and fecal samples to estimate population size and analyze blood and tissue to detect diseases and their effects on wolf health and behavior.

Population Size & Social Behavior

We conduct two population counts each year. The first, from mid-November to mid-December, shows the maximum population after pups have stabilized. The second, in March, reflects the population at the end of the biological year, just before denning season in late April.

During capture operations, biologists collect blood samples, record weight and body measurements, and determine the wolf's sex and age.

These observations help us track survival, mortality, and movements of individual wolves. Radio-tracking also reveals details about pack dynamics, such as pack size, the roles of breeders, territory use, den locations, and long-term pack stability. We also study interactions between packs, like territorial behavior, scent marking, and howling, to better understand their social structure.

Our latest research uses autonomous recording units (ARUs) to capture wolf howls throughout the park. This helps us study the patterns and purposes of howling and develop bioacoustic methods to estimate wolf numbers. These techniques are particularly useful in remote areas where direct observation is difficult. By combining data from radio collars with noninvasive tools like ARUs and remote cameras, we aim to enhance wolf population monitoring in Yellowstone and beyond.

Wolf–Prey Relationships

We study wolf–prey relationships by examining wolf diets and how often they hunt and scavenge. While we collect diet data year-round, we focus on specific seasons: early winter (mid-November to mid-December), late winter (March), and spring-summer (May–July).To better understand these interactions, we monitor the northern elk herd by fitting adult female elk with radio collars. This provides information to help us estimate the elk population, such as: survival, causes of death, habitat use, migration, and how likely elk are to be seen during aerial surveys. We also plan to revisit studies on elk calves, last conducted in 2003–2005, which showed bears as the main predators of newborn calves. By analyzing GPS data from

wolves and elk, we study how wolf presence, numbers, and kill locations affect elk movements. This research shows how wolves indirectly impact the ecosystem, including their role in food web dynamics and trophic cascades. A trophic cascade happens when changes at the top of the food chain, like wolf behavior, cause a ripple effect through other species and habitats, shaping the entire ecosystem.

Winter Predation Study

Our Winter Study, conducted every year since wolves were reintroduced to Yellowstone in 1995, takes place during early and late winter. Over these two 30-day periods, we study what wolves eat by identifying the type of prey (such as elk, bison, or deer), as well as the prey's sex and age, and how often wolves feed. We also examine feeding sites to see if prey were killed or scavenged, looking for clues like blood or the prey's nutritional condition.We detect feeding events through ground and aerial observations or by investigating clusters of wolf GPS locations. While we can't find every feeding event, combining these methods helps us estimate the ones we miss for each pack. During this time, we also observe wolf hunting behaviors to learn how factors like prey species, group size, or the age of wolves affect their hunting success.

Summer Predation Study

In the spring–summer period, we conduct our Summer Predation Study. During this time, wolves often forage in multiple groups and feed on smaller, newborn ungulates. Using GPS cluster searches, we systematically locate carcasses to understand what wolves eat and how frequently, focusing on seasonal variation in wolf diet.

Interactions with Other Species

Yellowstone biologists work with outside researchers to study how wolves, bears, and cougars interact in the Northern Range, using GPS collars to track their movements. For example, we've studied how bears affect wolf hunting and how bears or wolves influence cougar hunting. These studies help us understand the combined effects of carnivores on prey populations, coexistence, and competition.We also study how wolves indirectly provide food for scavengers. For instance, ravens benefit from wolf kills, and we plan to expand this research to other scavengers, like golden eagles. Using data such as GPS tracking, activity patterns, and remote camera footage, we explore how large carnivores and the carrion they leave behind affect scavenger behavior and decision-making.

Managing the Human–Wolf Interface

Wolves are very popular with visitors, and because they can often be seen, we sometimes need to manage interactions between wolves and people. This includes temporarily closing sensitive areas, managing traffic to protect both wolves and visitors, and occasionally hazing wolves to keep them from becoming too comfortable around people. These actions are based on years of experience and data from radio collars. This information also helps guide discussions with stakeholders and nearby wildlife management agencies about the shared Yellowstone wolf population.

Roadside Viewing of Wolves

Yellowstone is known as the best place in the world to see wild wolves, an attraction that brings over $80 million annually to local communities. However, this also means visitors often come close to wolves, requiring careful management to ensure safety, protect wildlife, and provide a world-class visitor experience. Park rules require people to stay at least 100 yards away from wolves, bears, and cougars and prohibit disturbing or approaching wildlife, but park staff often manage viewing opportunities at even greater distances to maintain safety. No-stopping zones might be created if wolves make a kill near a road. In some cases, carcasses are moved farther from roads to reduce risks while still allowing wildlife access. These decisions are made situationally, prioritizing visitor and wildlife safety first, followed by protecting resources and ensuring visitor enjoyment.

Wolf Homesites

To protect active wolf homesites during sensitive periods, the park may temporarily close certain areas. Homesites include dens, where pups are born and spend early summer, and rendezvous sites, where packs care for pups until they're old enough to travel. These closures, lasting from a few weeks to a few months, are decided case by case to minimize disturbances during this critical time.

Most wolf packs choose remote backcountry

homesites that require little management. However, when homesites are visible or discovered by visitors, intervention may be needed. Human activity near homesites can cause wolves to abandon the area and move their pups, increasing the risk of pup deaths. Frequent disturbances can also make wolves too comfortable around people, leading to unwanted behaviors.

While some homesites can be safely observed from a distance and enjoyed by thousands of visitors, closures aimed at reducing disturbances can also enhance visitor experiences by promoting responsible wildlife viewing and protecting the natural behavior of wolves.

Wolf watchers at Slough Creek, one of the best places in the world to observe wild wolves.

Wolf Habituation

Wolves rarely pose a threat to people, but if they become too comfortable around humans, safety concerns can arise. Preventing wolves from losing their natural wariness of humans is a key goal of Yellowstone's wolf management. This is why the park may temporarily stop traffic to let wolves cross a road or close areas near carcasses or dens to reduce disturbances.

Feeding wolves—or any wildlife—is strictly prohibited because it can quickly lead to habituation. Even behaviors like wolves traveling on snow-free or groomed roads can contribute to this problem. Managing these situations can be challenging, especially when wolves are drawn to roads for easier travel. Visitors play an important role by giving wolves plenty of space and allowing them to leave roads naturally.

If wolves start showing signs of being too comfortable around people, park staff may use techniques like hazing to discourage this behavior and reinforce their natural caution. These efforts help prevent habituation and ensure safer interactions between wolves and visitors.

Hazing Operations

Hazing is a step-by-step process that starts with mild actions and increases in intensity if the wolf doesn't respond. Low-level hazing methods include yelling, honking a car horn, or using a siren from a ranger's vehicle. Mid-level hazing uses biodegradable paintball rounds, which are safe for wolves and easy for park staff to handle and train with.

More intense hazing methods involve nonlethal tools like beanbag rounds or rubber bullets, which have more impact than paintballs. Another option is cracker shells, which are fired from a shotgun and create a loud explosion overhead to scare the wolf away.

Hazing is considered successful if the wolf stops showing habituated behavior within a year. If these methods fail and the wolf is seen as a potential danger to people, it may be removed from the population. Since wolves were reintroduced to Yellowstone in 1995, only two wolves have been removed due to habituation. In both cases, the wolves had likely been fed by humans, leading to irreversible food conditioning and behavior changes.

Working Across Boundaries

Most wolves in Yellowstone stay within the park, contributing to Wyoming's annual wolf population counts as required by US Fish and Wildlife Service guidelines for Endangered Species Act delisting. However, some packs have territories that extend beyond the park's boundaries, occasionally moving into neighboring states of Idaho, Montana, and Wyoming. These movements often happen during the fall elk migration, which overlaps with state-managed hunting seasons.

When wolves leave the park, they are subject to state wildlife regulations, including legal hunting during designated seasons. Yellowstone works with neighboring states by sharing data on wolf pack sizes, movements, and time spent outside the park to support state management decisions. The park also collaborates with state agencies to determine if wolves killed—legally or illegally—were part of packs that primarily live in Yellowstone.

Since wolves were delisted, some Yellowstone wolves are legally hunted each year under state-specific quotas, which vary by location and season. Ongoing research examines how hunting affects the park's wolf population, including its impacts on pack stability, pup survival, social behavior, and genetic health. This research helps us understand the broader effects of human-caused mortality on Yellowstone's wolves.

Education & Outreach

We are committed to educating both the public and the scientific community about wolves. In the field, our staff track wolves, collect data, and share their knowledge with visitors. When wolves are visible, we often set up spotting scopes and talk with visitors about Yellowstone's wolf population, their history of removal and recovery, and their role in the park's ecosystem. These interactions educate visitors while supporting the National Park Service's mission to provide a world-class experience focused on protecting and preserving resources.

Each year, we reach tens of thousands of visitors through these roadside discussions. Beyond the field, we deliver hundreds of presentations to schools and universities, create video content, participate in media interviews, lead ranger programs, and share insights through podcasts. Our annual report keeps the public informed about wolf populations, prey interactions, and other ecological factors. Our nonprofit partner, Yellowstone Forever, also provides valuable educational content about wolves.

For the scientific community, we present our findings at conferences and work with university and agency scientists to publish peer-reviewed research. These publications contribute to better wolf management practices in Yellowstone and other areas where wolves are present.

Lean more about wolf management at **www.nps.gov/yell/learn/management/wolf.htm**

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Staff Reviewers

Daniel Stahler, Senior Wildlife Biologist
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Coyotes

Coyotes (*Canis latrans*) are intelligent and adaptable. They can be found throughout North and Central America, thriving in major urban areas as well as in remote wilderness. This adaptability helped coyotes resist widespread efforts early in the 1900s to exterminate them in the West, including in Yellowstone National Park, where other mid-size and large carnivores such as cougars and wolves were eradicated. The coyote is a common predator in Greater Yellowstone, often seen traveling through open meadows and valleys.

Description

Often mistaken for a wolf, the coyote is about one-third the wolf's size with a slighter build. Its coat colors range from tan to buff, sometimes gray, and with some orange on its tail and ears. Males are slightly larger than females.

During the 1900s, coyotes partially filled the niche left vacant after wolves were exterminated from the park. In Yellowstone, they lived in packs or family groups of up to seven animals. This social organization is characteristic of coyotes living in areas free from human hunting. With the reintroduction of wolves, Yellowstone coyotes have returned to a more typical social organization—pairs with pups.

Coyotes are abundant throughout the park, and pup survival has increased. Coyotes may be killed by disease and vehicle-collisions as well as by other carnivores like wolves and cougars.

Coyotes, also known as "song dogs," communicate with each other by a variety of long-range vocalizations. You may hear groups or lone animals howling, especially during dawn and dusk periods. Coyotes also mark with their scent (urine and feces) to communicate their location, breeding status, and territorial boundaries.

Quick Facts

Number in Yellowstone
Abundant

Where to See
Meadows, fields, other grasslands, and foraging for small mammals along roadways.

Size and Behavior

- Weigh 25–35 pounds, stand 16–20 inches high at the shoulder.
- Average life span six years; up to 13 years in the park.
- Home range: three to fifteen square miles.
- Primarily eat voles, mice, rabbits, other small animals, and carrion—and very young elk calves in the spring.
- Four to eight pups are born in April in dens; emerge in May.

History

- Like other predators, coyotes were often destroyed in the early part of the 1900s because they sometimes preyed on livestock.
- Coyotes continued to thrive because their adaptability enabled them to compensate for the destruction efforts.
- Elimination of wolves probably resulted in high coyote population densities; wolves' absence opened a niche that coyotes could partially occupy in Yellowstone.

Population

Until 1995, coyotes faced few predators in Yellowstone other than cougars, who will kill coyotes feeding on cougar kills. After wolves were restored, however, dozens of coyote pups and adults were killed by wolves—primarily when feeding on other animals killed by wolves. After wolves were restored on the northern range, the coyote population decreased by as much as 50% as a result of competition for food, attacks by wolves, and loss of territory to wolves. More recent trends in the Lamar Valley, however, indicate that the coyote population has increased.

Comparisons of coyote population and behavioral data from before and after wolf restoration provide evidence of how the presence of wolves is changing ecological relationships on the northern range. A reduced coyote population could mean that smaller predators, such as the native red fox, whose numbers were previously kept low by coyotes, will have less competition for small prey and their populations may increase. While this relationship is yet to be evaluated critically, recent data from remote camera studies in

the park show that coyotes and red foxes have opposite peaks and lulls in their daily activity patterns in winter months. This suggests some level of temporal avoidance is occurring, despite their ubiquitous occupancy of similar habitats. Furthermore, data suggests movement patterns and habitat use overlaps with top predators like wolves and cougars in a way that balances the risks and rewards of scavenging from predator kills given that these smaller canids are sometimes killed by the larger carnivores.

Coyotes and Humans

Coyotes also face threats from humans. They quickly learn habits like roadside feeding. This may lead to aggressive behavior toward humans and can increase the risk of the coyote being hit by a vehicle. Several instances of coyote aggression toward humans, including a few attacks, have occurred in Yellowstone.

Park staff scare coyotes away from visitor-use areas and prevent them from becoming habituated to humans by hazing with cracker-shell rounds, bear pepper spray, or other negative stimuli. Animals that continue to pose a threat to human safety or property are killed.

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Coyotes (middle) are larger than red foxes (front) and smaller than wolves (back).

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Staff Reviewer

Daniel Stahler, Senior Wildlife Biologist

Red Foxes

The red fox (*Vulpes vulpes macroura*) has been documented in Yellowstone since the 1880s. In relation to other canids in the park, red foxes are the smallest. Red foxes occur in several color phases, but they are usually distinguished from coyotes by their reddish-yellow coat that is somewhat darker on the back and shoulders, with black "socks" on their lower legs. "Cross" phases of the red fox (a dark cross on their shoulders) have been reported a few times in recent years near Canyon and Lamar Valley. Also, a lighter-colored red fox has been seen at higher elevations.

Three native subspecies exist at high elevations in the United States: the Sierra (*V. v. necatar*), Cascade (*V. v. cascadensis*), and Rocky (*V. v. macroura*) mountains and are collectively called mountain foxes. Little is known about any of these subspecies. Most foxes in the lower 48 states, particularly in the eastern and plains states, are a subspecies of fox from Europe introduced in the 1700s and 1800s for fox hunts and fur farms. The foxes that survived the hunt or escaped the fur farms proliferated and headed westward.

Population

Red foxes are more abundant than were previously thought in Yellowstone. The many miles of forest edge and extensive semi-open and canyon areas of the park seem to offer suitable habitat and food for foxes. They are widespread throughout the northern part of the park with somewhat patchy distribution elsewhere in the park. During the past century, especially within the past few decades, the number of fox sightings has significantly increased. This could be related to better documentation beginning in 1986. Wolves and coyotes are more closely related both genetically and physically than wolves and foxes.

During winter, red foxes may increase their activity around dawn and dusk, and even sometimes in broad daylight.

Wolves successfully competed with coyotes, causing a decline in the coyote population when they were reintroduced. This may have caused an increase in the number of fox sightings in core wolf areas such as the Lamar Valley.

A research project conducted between 1994–1998 determined at least two subpopulations of foxes live in the Greater Yellowstone Ecosystem. At about 7,000 feet in elevation, there seemed to be a dividing line with no geographical barriers separating these foxes. The genetic difference between these subpopulations was similar to the differences between mainland and island populations of foxes in Australia. Habitat use across the two groups was different as well. In addition, their actual dimensions, such as ear length and hind-foot length, were adapted to some degree for colder environments with deep snow and long winters. A yellowish or cream color most often occurs above 7,000 feet in areas such as Cooke City and the Beartooth Plateau, and this variation is being studied by researchers.

Quick Facts

Number in Yellowstone
Unknown, but not nearly as numerous as coyotes.

Where to See

- Hayden and Pelican valleys, Canyon Village area.
- Typical habitat: edges of sagebrush/grassland and within forests.

Size and Behavior

- Adult males weigh 11–12 pounds; females weigh average 10 pounds.
- Average 43 inches long.
- Average life span: three to seven years; up to 11 years in Yellowstone.
- In northern range, home range averages 3.75 square miles, with males having slightly larger range than females.
- Several color phases; usually red fur with white-tipped tail, dark legs; slender, long snout.
- Barks; rarely howls or sings.
- Distinguished from coyote by size, color, and bushier tail.
- Solitary, in mated pairs, or with female from previous litter.
- Prey: voles, mice, rabbits, birds, amphibians, other small animals.
- Other food: carrion and some plants.
- Killed by coyotes, wolves, mountain lions.

Red foxes (front) are smaller than coyotes (middle) and wolves (back).

Behavior

Foxes are not often seen because they are nocturnal, usually forage alone, and travel along edges of meadows and forests. During winter however, foxes may increase their activity around dawn and dusk, and even sometimes in broad daylight. In late April and May, when females are nursing kits at their dens, they are sometimes more visible during daylight hours, foraging busily to get enough food for their growing offspring.

Recent research shows that red foxes are more nocturnal than coyotes, and strongly prefer forested habitats, while coyotes tend to use sagebrush and open-meadow areas. In this way, potential competition between foxes and coyotes is minimized. Foxes do not seem to actively avoid coyotes during an average day, they just stick with forested habitat, sleep when coyotes are most active, and then forage opportunistically. Foxes will visit carcasses (e.g., wolf and cougar kills) for the occasional big meal, especially during winter, but this is much rarer than the scavenging coyotes that park visitors can expect to see regularly.

Data from remote camera studies in the park also show that coyotes and red foxes have opposite peaks and lulls in their daily activity patterns in winter months. This suggests some level of temporal avoidance is occurring, despite their ubiquitous occupancy of similar habitats. Furthermore, data suggests movement patterns and habitat use overlaps with top predators like wolves and cougars in a way that balances the risks and rewards of scavenging from predator kills given that these smaller canids are sometimes killed by the larger carnivores.

Foxes can become habituated to humans, usually due to being fed. In 1997, one fox was trapped and relocated three times from the Tower Fall parking area because visitors fed it human food. The fox was relocated between 10 and 60 miles away from Tower, but it returned twice. Finally, the fox came to Mammoth where it was fed again and as a result was killed by managers. While this story gives us interesting information about the homing instinct of the fox, it also shows the importance of obeying rules to avoid inadvertently causing the death of one of Yellowstone's animals.

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Staff Reviewer

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Cougars

The cougar (*Puma concolor*), also known as mountain lion, is the one of the largest cats in North America and a top predator native to Greater Yellowstone. (The jaguar, which occurs in New Mexico and Arizona, is larger.) As part of predator-removal campaigns in the early 1900s, cougars and wolves were killed throughout the lower 48 states, including in national parks. Wolves (*Canis lupus*) were eradicated, and, although cougars were largely eliminated from Yellowstone, the species survived in the West because of its cryptic nature and preference for rocky, rugged territory where the cats are difficult to track. Eventually, the survivors re-established themselves in Yellowstone in the early 1980s, possibly making their way from wilderness areas in central Idaho.

This male cougar was photographed by a remote camera during the 2014 research study.

Population

Prior to wolf reintroduction (1987–1993), Yellowstone National Park's northern range was occupied year-round by an estimated 15 to 22 cougars, including adults, subadults, and kittens. There were 26–42 cougars estimated after wolf establishment (1998–2005). In 2014, a new study began which seeks to estimate population abundance in the same region using noninvasive genetic-survey methods. Biologists estimated between 29–45 individuals resided across the northern portion of Yellowstone (all age and sex classes combined) between 2014 and 2017 (Anton 2020). Currently, population estimation is underway using a remote camera survey grid methodology with preliminary results indicating a stable population since 2017. Since 2016, Global Positioning Collars (GPS) are used to study movements, predation, and population monitoring on 4–7 individuals a year..

While disease and starvation are occasional causes of cougar deaths, competition with other cougars or predators, and human hunting (during legal seasons outside protected areas), are the main causes of cougar mortality. Habitat fragmentation and loss are the main long-term threats to cougar populations across the western United States.

Behavior

Cougars live throughout the park in summer, but few people ever see them. The northern range of Yellowstone is prime habitat for cougars because snowfall is light and prey always available. Cougars follow their main prey as they move to higher elevations in summer and lower elevations in the winter.

Adult male cougars are territorial and may kill other adult males in their home range. Male

Quick Facts

Number in Yellowstone
Estimated 29–45 (across all age classes) on the northern range; others in park seasonally.

Where to See
Seldom seen

Size and Behavior

- Litters range from three to four kittens; 50% survive first year.
- Adult males weigh 145–170 pounds; females weigh 85–120 pounds; length, including tail, 6.5–7.5 feet.
- Average life span: males, eight–10 years; females, 12–14 years. Cougars living in areas where they are hunted have much shorter average life spans.
- Preferred terrain: rocky breaks and forested areas that provide cover for hunting prey and for escape from competitors such as wolves and bears.
- Prey primarily on elk and mule deer, plus smaller mammals, especially marmots.
- Bears and wolves frequently displace cougars from their kills.
- Male cougars may kill other male cougars within their territory.
- Adult cougars and kittens have been killed by wolves.

Interaction with Humans
Very few documented confrontations between cougars and humans have occurred in Yellowstone.

If a big cat is close by, stay in a group; carry small children; make noise. Do not run, do not bend down to pick up sticks. Act dominant—stare into the cat's eyes and show your teeth while making noise.

territories may overlap with several females. In non-hunted populations, such as in Yellowstone, the resident adult males living in an area the longest are the dominant males. These males sire most of the litters within a population; males not established in the same area have little opportunity for breeding.

Although cougars may breed and have kittens at any time of year, most populations have a peak breeding and birthing season. In Yellowstone, males and females breed primarily from February through May. Males and females without kittens search for one another by moving throughout their home ranges and communicating through visual and scent markers called scrapes. A female's scrape conveys her reproductive status. A male's scrape advertises his presence to females and warns other males that an area is occupied. After breeding, the males leave the female.

In Yellowstone, most kittens are born between June and September. Female cougars den in a secure area with ample rock and/or vegetative cover. Kittens are about one pound at birth and gain about one pound per week for the first 8–10 weeks. During this time, they remain at the den while the mother makes short hunting trips and then returns to nurse her kittens. When the kittens are about 10 weeks old, the female begins to hunt over a larger area. After making a kill, she moves the kittens to the kill. Before hunting again, she stashes the kittens. Kittens are rarely involved in killing until after their first year.

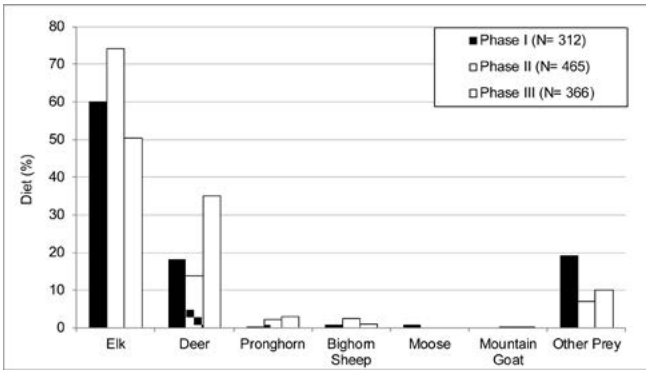
Most kittens leave their area of birth at 14 to 18 months of age. Approximately 99% of young males disperse 50 to 400 miles; about 70–80% of young females disperse 20 to 150 miles. The remaining proportion of males and females establishes living areas near where they were born. Therefore, most resident adult males in Yellowstone are immigrants from other areas, thus maintaining genetic variability across a wide geographic area. In Yellowstone, cougars prey upon elk (mostly calves) and deer. They stalk the animal then attack, aiming for the animal's back and killing it with a bite to the base of the skull or the throat area.

This male cougar kitten was briefly examined and genetically sampled in summer of 2016.

A cougar eats until full, then caches the carcass for later meals. Cougars spend an average of three to four days consuming an elk or deer and four to five days hunting for the next meal. Cougars catch other animals—including red squirrels, porcupines, marmots, grouse, and moose—if the opportunity arises.

Cougars are solitary hunters who face competition for their kills from other large mammals. Even though a cached carcass is harder to detect, scavengers and competitors such as bears and wolves sometimes find it. In Yellowstone, black and grizzly bears will take over a cougar's kill. Coyotes will try, but can be killed by the cougar while doing so. Wolves displace cougars from approximately 6% of their elk carcasses.

Although cougars and wolves once co-existed across much of their historical range, ecological research on each species has often had to be conducted in the absence of the other. By assessing pre- and post-wolf reintroduction data, biologists can learn about the ecological relationships between the



Species composition of cougar-killed prey, including primary ungulate prey species and other prey (e.g., marmots, grouse, foxes, coyotes, porcupines), across three research phases (phase I: 1987–1993; phase II: 1998–2004; and phase III: 2014–present; sample sizes of kills detected are indicated in parentheses).

two species. As social animals, wolves use different hunting techniques from the solitary cougar, but the two species prey on similar animals. While prey is abundant this competition is of little concern, but, a decrease in prey abundance could lead to an increase in competition between these carnivores.

History

In the early 1900s, cougars were killed as part of predator control in the park and largely eradicated, along with wolves, in the 1930s. While there may have been some individuals that persisted in the Greater Yellowstone Ecosystem, there is no evidence of an ecologically viable population present after the 1930s. However, cougars naturally recolonized by the early 1980s.

From 1987 to 1996, the first cougar-ecology study was conducted in Yellowstone National Park. The research documented population dynamics of cougars in the northern Yellowstone ecosystem inside and outside the park boundary, determined home ranges and habitat requirements, and assessed the role of cougars-as-predator. Of the 88 cougars captured, 80 were radio-collared.

From 1998 to 2006, the second phase of that research was conducted. Researchers monitored 83 radio-collared cougars, including 50 kittens in 24 litters. Between 1998 and 2005, researchers documented 473 known or probable cougar kills. Elk comprised 74%: 52% calves, 36% cows, 9% bulls, 3% unknown sex or age. Cougars killed about one elk or deer every 9.4 days and spent almost four days at each kill. The study also documented that wolves interfered with or scavenged more than 22% of the cougar-killed ungulates.

In 2014, the park began new research to evaluate population abundance, predation patterns, and competition with other carnivores. Currently, the park is home to a healthy, stable year-round population of cougars on the northern range where prey is available all year. Cougars also occupy many areas in the park's interior during the summer but vacate during winter due to lack of prey..

Very few cougar–human confrontations have occurred in Yellowstone. However, observations of cougars, particularly those close to areas of human use or residence, should be reported.

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Staff Reviewer

Dan Stahler, Senior Wildlife Biologist

Canada Lynx

Historical information suggests lynx (*Lynx canadensis*) were present, but uncommon, in Yellowstone National Park during 1880 to 1980. The presence and distribution of lynx in the park was documented from 2001 to 2004, when several individuals were detected in the vicinity of Yellowstone Lake and the on the Central Plateau. A lynx was photographed in 2007 along the Gibbon River, and another lynx was observed near Indian Creek Campground in the northwestern portion of Yellowstone during 2010. Tracks of an individual were verified near the Northeast Entrance in 2014. Reliable detections of lynx continue to occur in surrounding National Forest System lands. Evidence suggests lynx successfully reproduce in the greater Yellowstone ecosystem (GYE), though production is limited.

In 2000, the US Fish and Wildlife Service listed the lynx as threatened in the lower 48 states. Portions of the park and surrounding area are considered much of the critical habitat for the species in the GYE.

Habitat

Lynx habitat in the Greater Yellowstone Ecosystem is often naturally patchy due to natural fire frequency and is generally limited to conifer forests above 7,700 feet where the distribution of its primary prey, the

Quick Facts

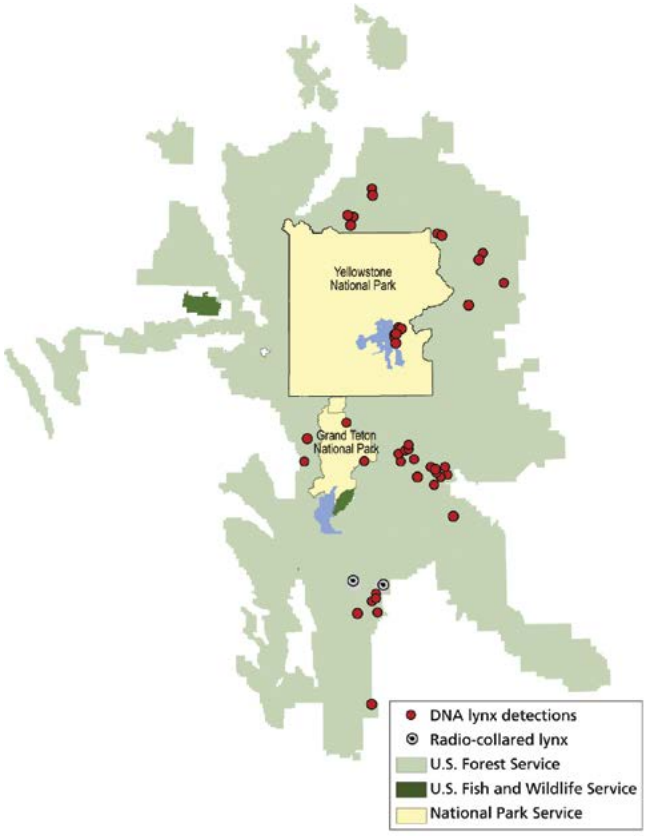
Number in Yellowstone
Few; 112 known observations

Where to See
- Very rarely seen.
- Typical habitat: cold conifer forests.

Size and Behavior
- Adult: 16–35 pounds, 26–33 inches long.
- Gray-brown fur with white, buff, or brown on throat and ruff; tufted ears; short tail; hind legs longer than front legs.
- Distinguish from bobcat: black rings on tail are complete; tail tip solid black; longer ear tufts; larger track.
- Wide paws with fur in and around pads; allows lynx to run across snow.
- Track: four to five inches.
- Solitary; diurnal and nocturnal.
- Eats primarily snowshoe hares, particularly in winter; also rodents, rabbits, birds, red squirrels, and other small mammals, particularly in summer.

COURTESY FRED PAULSEN

In December 2007, Fred Paulsen, a Xanterra Parks and Resorts employee in Yellowstone, photographed this lynx along the Gibbon River. In 2010, visitors also saw a lynx, which was wearing a radio collar—indicating it may have come from Colorado where the population is collared.



DNA-based detections of lynx documented in the Greater Yellowstone Ecosystem, 1996 to 2008. Numerous locations of radio-collared lynx from Colorado that were obtained using satellite-based telemetry are unavailable. Data provided by Endeavor Wildlife Research, Wild Things Unlimited, the US Forest Service, and the National Park Service.

snowshoe hare, is often insufficient to support lynx residency and reproduction. The lower-quality habitat means home ranges in this ecosystem are larger than those farther north, with lynx traveling long distances between foraging sites.

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Staff Reviewer

Dan Stahler, Senior Wildlife Biologist

Bobcats

Lynx rufus

Number in Yellowstone

Unknown, but generally widespread.

Where to See

- Rarely seen; most reports from rocky areas and near rivers.
- Typical habitat: rocky areas, conifer forests.

Size and Behavior

- Adult: 15–30 pounds; 31–34 inches long.
- Color ranges from red-brown fur with indistinct markings to light buff with dark spotting; short tail; ear tufts.
- Distinguished from lynx: has several black rings that do not fully circle the tail; no black tip on tail; shorter ear tufts; smaller track (two inches).
- Solitary; active between sunset and sunrise.
- Eats rabbits, hares, voles, mice, red squirrels, wrens, sparrows, grouse; may take deer and adult pronghorn.

Bats

Bats are the only mammals capable of sustained, flapping flight, which has given rise to a great diversity of species throughout the world. All bat species documented in Yellowstone National Park are insectivores (insect-eaters). To support the energy demands for flight, insectivorous bats must eat many insects. Nursing females can consume their own body weight in food each night during the summer. In temperate environments, bats mate in late summer or autumn, just before entering hibernation for the winter. During spring and summer, bats tend to be highly localized near sources of food, water, and roosting structures. They roost in natural habitats, including thermally heated caves, as well as in bridges, buildings, and other human structures. Bats are considered indicator species because their distribution and population trends provide valuable information about habitat quality and the overall health of an ecosystem.

Population

Bat-monitoring efforts using acoustic surveys at 36 point stations and mist-net captures have identified the following thirteen bat species in Yellowstone National Park:

- Little brown bat (*Myotis lucifugus*)
- Big brown bat (*Eptesicus fuscus*)
- Long-eared myotis (*Myotis evotis*)
- Long-legged myotis (*Myotis volans*)
- Townsend's big-eared bat (*Corynorhinus townsendii*)
- Fringe-tailed bat (*Myotis thysanodes*)
- Hoary bat (*Lasiurus cinereus*)
- Silver-haired bat (*Lasionycteris noctivagans*)
- Spotted bat (*Euderma maculatum*)
- Pallid bat (*Antrozous pallidus*)
- California Myotis (*Myotis californicus*)
- Western-Small-footed Myotis (*Myotis ciliolabrum*)
- Yuma myotis (*Myotis yumanensis*)

The goal of bat monitoring in Yellowstone is to establish baseline data on the distribution, activity, and habitat use by bat species and identify impacts to bat populations from the disease white-nose syndrome (WNS). The fungal pathogen *Pseudogymnoascus destructans* (Pd), which causes WNS, has been responsible for declines as high as 99% in wintering bat populations, leading to the extirpation of several species in eastern North America. Bats cannot recover quickly, if at all, from these substantial population declines because most species that are vulnerable to WNS rear only a single pup per female each year. As of 2024, WNS has been confirmed in 9 Canadian provinces and 40 states, including Montana and Wyoming. However, monitoring efforts in Yellowstone have not yet detected Pd in the park. The Yellowstone wildlife health program tested 99 samples for Pd from bat skin swabs and guano samples in 2024 with consistent Pd negative results.

Physical adaptations to their environments have given bats their looks. The large ears of this Townsend's big-eared bat (*Corynorhinus townsendii*), held by a researcher, help it locate its prey.

It is important to identify the location of maternity roosts and hibernacula, locations that are used for

Quick Facts

Species in Yellowstone
13

Where to See
Dawn and dusk in areas with insects.

Behavior

- Develop and reproduce slowly, which is unusual given their small body size.
- Typically mate in the fall. In bats that hibernate, fertilization is delayed until the female emerges from hibernation. For most greater Yellowstone bats, hibernation ends around mid-April and the females give birth in mid-June.
- Most give birth to one pup a year, although four species in the greater Yellowstone area have two or more pups at a time. These species typically begin flying in two to six weeks, are weaned around five to ten weeks, and become mature in one to two years.
- Few predators specialize on bats. Predators are generally opportunistic and include owls, falcons, hawks, snakes, and raccoons.
- Of bats that survive their first year, 40–80% survive seven to eight years; many bats live 10–30 years.

reproduction and over-winter survival, respectively. Female bats captured with mist-nets and fitted with radio transmitters have helped to identify buildings that serve as maternity roosts (where females raise young) for little brown bats. Research suggests that access to building attics within Yellowstone National Park is critical for their reproductive success and long-term conservation.

Habitat

Roosts provide bats with protection from weather and predators and bats in Greater Yellowstone use both natural habitats and man-made structures including bridges and abandoned mines. Research suggests that that the thermal conditions in maternity roosts are important for the reproductive success of little brown bats. Roosts allow young bats to maximize their growth rate, wean, and begin to fly and forage earlier because they use less energy to stay warm. Bats are long-lived (10–30 years) and show fidelity to maternal roost sites where they have successfully raised young. For this reason, bats will continually return to attics of park buildings, which can lead to conflicts with human use and historical preservation plans.

The presence of other bats in Yellowstone is probably restricted by the limited location of suitable roosts and/or the distribution of insect prey. Most western bat species migrate short distances from their summer roosts to their winter hibernating locations. However, bat activity has been documented within Yellowstone during every month of the year, which suggests multiple bat species remain within Yellowstone over winter. Some species migrate long distances to areas where temperature and insect populations support continued activity. These species may not hibernate. In Greater Yellowstone, the hoary bat likely migrates south for the winter.

Physical Adaptations

Bats with long, narrow wings (e.g., the hoary bat) are fast but less maneuverable fliers that typically forage in open areas. Bats with short, broad wings (e.g., Townsend's big-eared bat) are slower but more agile fliers and typically forage in or near forested areas. A few Yellowstone bats, such as long-eared myotis, pallid bat, and Townsend's big-eared bat, can glean insects off the surface of vegetation, and have wing shapes that enable them to hover and carry larger prey.

Bats use echolocation to navigate and forage in the dark. Many species produce pulses of high-frequency, ultrasonic sound and listen for the returning echoes. The echoes provide bats with a sonic picture of the environment, which includes the movement of prey. High-frequency calls are less likely to alert predators and are effective for locating prey, although some moths have developed the capability of detecting such calls. Bats also use lower-frequency calls (often audible to humans) to communicate with each other.

Bats make efficient use of the energy obtained through foraging by regulating their body temperature (thermoregulation). To conserve energy, bats can enter a state of torpor, which allows them to lower their metabolic rate and body temperature. Most bat species in Greater Yellowstone use torpor during winter months and periods in spring and summer with cold nightly temperatures and reduced food availability

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Staff Reviewers

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Beavers

The beaver (*Castor canadensis*) is a keystone species that affects habitat structure and dynamics through the damming and diverting of streams and the felling of trees and other woody vegetation. The resulting ponds and flooding help create an environment favorable to willow and aspen, the beavers' preferred winter foods and lodge-building material. The territoriality of beavers probably deters two colonies from locating within 165 feet (50 m) of each other, and most streams in the park lack either suitable vegetation or a sufficiently low gradient to provide beavers with habitat, but information about the distribution and number of beaver colonies in the park over time adds to our understanding of the long-term effects of changes in vegetation and climate.

The beaver is a keystone species that affects habitat structure and dynamics through the damming and diverting of streams, and the felling of trees and other woody vegetation.

Habitat

Beavers live throughout Yellowstone National Park but are concentrated in the southeast (Yellowstone River delta area), southwest (Bechler area), and northwest portions (Madison and Gallatin rivers) of the park. These areas are likely important habitat because of their waterways, meadows, and the presence of preferred foods such as willow, aspen, and cottonwood.

However, beavers are not restricted to areas that have their preferred foods. Essentially no aspen exist in most areas where beavers' sign is most abundant, such as the Bechler River, or in other areas where beavers periodically live, such as Heart Lake, the lower Lamar River and Slough Creek area, Slide Lake, and the lower Gardner River. In these areas, beavers use willows for construction and for food. Where their preferred plants are few or absent, beavers may cut conifer trees and feed on submerged vegetation such as pond lilies.

Beavers are famous dam builders, and examples of their work can be seen from the roads in the park. Most dams are on small streams where the gradient is mild and the current is relatively placid during much of the year. Colonies located on major rivers or in areas of frequent water-level fluctuations, such as the Lamar River, den in holes in the riverbank. An old dam is visible at Beaver Lake between Norris and Mammoth.

When hunched over their food, beavers can resemble round rocks. Beavers are most active in the

Quick Facts

Number in Yellowstone
121 colonies estimated in 2024

Where to See

- Willow Park (between Mammoth and Norris) and the Gallatin River along US 191.
- In the backcountry: upper Yellowstone River (Thorofare region), Bechler River, Slough Creek, Cougar and Gneiss Creeks. Occasionally seen in the Lamar, Gardner, and Madison rivers
- Wait in areas near known beaver activity. You may see them swimming or clambering onto the bank to gnaw at trees and willows. Listen for the sound of the beaver slapping its tail on the water before it submerges to seek safety.

Size and Behavior

- Crepuscular: active in evening and morning.
- If living on rivers, may build bank dens instead of lodges.
- One colony may support two to 14 beavers that are usually related. Six is considered average.
- 35–40 inches long, including tail.
- Weighs 30–60 pounds.
- Average life span: five years.
- Male and female beavers look alike—thick brown fur, paddle-shaped tail.
- Like wolves, beavers live in family groups, which are called colonies. Fewer than 5% of mammals live organized like this.

Other Information

- Beavers are native to Yellowstone.
- Yellowstone's beavers escaped most of the trapping that occurred in the 1800s due to the region's inaccessibility.

early morning and late evening, which seems to allow them to use areas near human use. Beavers do not appear to avoid areas of moderate to high levels of human use. Several occupied lodges in Yellowstone are close to popular backcountry trails and campsites.

Population

The first survey of beavers in the park, conducted in 1921, reported 25 colonies, most of them cutting aspen trees. Although the survey was limited to parts of the northern range, comparing the locations of those beaver colonies with subsequent survey results demonstrates how beavers respond and contribute to changes in their habitat. A 1953 survey found eight colonies on the northern range, but none at the sites reported in 1921, and a lack of regrowth in cut aspen. Willow were also in decline during this period.

To help restore the population of beavers on Gallatin National Forest, 129 beavers were released into drainages north of the park from 1986 to 1999. Parkwide aerial surveys began in 1996, with a count of 49 colonies, followed by an increase to 127 by 2007. While the long-term increase is partly attributable to the improved capability of aerial observers to locate colonies, the park's population of beavers probably has grown in the past 20 years. Since 2011, surveys have documented anywhere from 51 colonies (2017) to 121 (2024) parkwide. This variation is likely due to natural fluctuations in beaver population dynamics and influenced by colony sightability challenges typical of aerial surveys. The historic flood of 2022 also altered beaver habitat and disrupted colonies along some northern range watersheds. Some of the increase likely came from beavers dispersing from the national forest, but they would not have survived without suitable habitat. The increase has occurred throughout the park and is likely related to the resurgence in willow since the late 1990s, at least on the northern range, and possibly in the park interior. Nearly all of the colonies documented in recent years were located in or near willow stands, none near aspen.

Willow, which is more common in the park than aspen, is a hardier shrub that quickly regenerates after being clipped by beavers. The reason for the prolonged decline and relatively sudden release of willow on the northern range, and whether aspen have begun a sustained surge in recruitment, are topics of intense debate. Possible factors include the relationship of these plant species to changes in the abundance of beavers and elk, fire suppression, the recovery of large carnivores, and climate change.

The preferred foods of beaver are willow, aspen, and cottonwood. Where their preferred plants are few or absent, beavers may cut conifer trees and feed on submerged vegetation such as pond lilies.

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Staff Reviewers

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Daniel Stahler, Senior Wildlife Biologist

Pikas

The pika (*Ochotona princeps*) is considered an indicator species for detecting ecological effects of climate change. While abundant in the Greater Yellowstone Ecosystem, pika numbers are declining in some areas of lower elevations in response to increased warming, which reduces their suitable habitat. The US Fish and Wildlife Service review of the pika found no current need to list the species as threatened or endangered; however, pikas will likely disappear from some lower-elevation or warmer sites.

Behavior

Pikas are territorial. They inhabit rocky alpine and sub-alpine zones, feeding on the vegetation that fringes their preferred talus slopes. Because pikas do not hibernate, this relative of the rabbit must gather enough plant materials during the short growing season to survive the winter. Piles of drying vegetation, called haystacks, and a distinctive high-pitched call are the most recognizable indicators of active pika habitat. Prolific breeders, pikas usually have two litters of young each summer. The mortality rate is high for the youngsters, and the first litter has a greater rate of survival. These small mammals are sensitive to temperatures above 77.9°F (25.5°C); therefore, they are most active during cooler parts of the day.

Outlook

The National Park Service's five-year project, Pikas in Peril, assessed the vulnerability of the pika to climate change by studying populations in eight western national parks. The study located many small, isolated territories in Yellowstone. Initial analysis at the end of 2015 predicted that pika habitat would decline 80% by 2026 and that pika would eventually be extirpated from the park. Further analysis found that habitat sites did not decline; but population modeling showed that resident turnover can be high (50% between some years). Turnover is exacerbated by winter cold stress, summer heat stress, and variation in site-habitat quality. High genetic diversity among the Yellowstone pika population may increase their resistance to these stressors. www.nps.gov/orgs/1778/pikas-in-peril.htm.

A pika, blending in with its surroundings, carries greenery to its haystack. Yellowstone provides classic talus habitat for pikas.

Reviewer
Tom Rodhouse, Natural Resources Stewardship and Science Directorate

Quick Facts

Number in Yellowstone
Abundant

Where to See
Tower and Mammoth areas.

Identification and Behavior

- 7–8.4 inches long, 5.3–6.2 ounces (about the size of a guinea pig).
- Active year-round; agilely darts around on rocks; travels through tunnels under snow.
- Breeds in spring; two litters per year.
- Often heard but not seen; makes a distinct shrill whistle-call or a short "mew."
- Grey to brown with round ears; no tail; blends in with rocks.
- Scent-marks by frequently rubbing cheeks on rocks.
- In late summer, it gathers mouthfuls of vegetation to build "haystacks" for winter food; defends haystacks vigorously.
- Haystacks often built in same place year after year; have been known to become three feet in diameter.
- Like rabbits and hares, pika eat their own feces, which allows additional digestion of food.

Habitat

- Found on talus slopes and rock falls at nearly all elevations in the park.
- Eats grasses, sedges, aspen, lichen, and conifer twigs.
- Predators include coyotes, martens, and hawks.

Management Concerns
Pikas are vulnerable to loss of habitat related to climate change.

White-tailed Jackrabbits

Considered an agricultural or garden pest in many parts of the country, the white-tailed jackrabbit (*Lepus townsendii*) found a niche in Yellowstone. Most of the park is too forested or accumulates too much snow to provide suitable habitat, but in lower-elevation areas of the northern range this animal can feed on sagebrush, rabbitbrush, and other shrubs during the winter. The jackrabbit is preyed upon by bobcats, coyotes, wolves, eagles, hawks, and owls in the park, but perhaps because of its limited distribution, it does not appear to provide a significant source of food for these species.

The coat of white-tailed jackrabbits turns white during winter in Yellowstone and other areas with snow.

Description

Despite its common name, the jackrabbit is more closely related to other hares than to rabbits (*Sylvilagus spp.*). Like the much smaller snowshoe hare (*L. americanus*), which resides in Yellowstone's coniferous forests, the jackrabbit has a grayish-brown summer coat that turns nearly white to provide winter camouflage in areas with persistent snow cover. The slightly smaller black-tailed jackrabbit (*L. californicus*), which is found in lower elevation areas, has not been documented in the park and is generally less common in greater Yellowstone.

Population

Nearly all of the 501 jackrabbit observations recorded in 2008, and the spottier records kept prior to that year were made in sagebrush-grassland habitat at elevations below 6,500 feet (2,000 m) where the average annual precipitation is fewer than 16 inches (40 cm). Less than 1% of the park (about 18,700 acres) is located in these areas. In Yellowstone National Park, jackrabbits currently occupy the area from the Gardiner Basin south to Mammoth Hot Springs and east to the Blacktail Plateau. Review of the historical record indicates that jackrabbits used to also occupy the slopes of Mount Washburn and the lower elevations of the Lamar Valley. However, there have been no known observations of jackrabbits east of the Blacktail Plateau since the early 1950s.

Quick Facts

Number in Yellowstone
Common in suitable low elevation habitats in the park.

Where to See
Elevations below 6,500 feet from the Blacktail Plateau to Mammoth to the Gardiner Basin area.

Identification

- Easily distinguished from true rabbits by their large ears, large feet, and generally large body size.
- Use their ears to listen for danger and to radiate body heat. Large ears allow them to release excess body heat and tolerate high body temperatures.
- Summer coat is grayish brown, with a lighter underside. In Yellowstone and other places where there is persistent and widespread snow cover, the coat changes to nearly white in winter. Ears are rimmed with black.

Habitat

- Found in prairie-grassland and grass-shrub steppe habitat types in western high plains and mountains. They generally prefer grass-dominated habitats and have also been found to flourish above treeline in the alpine zone and avoid forested areas.

Behavior

- Have one to four litters per year with up to 15 offspring.
- Gestation is 36–43 days.
- In most areas, the breeding season of white-tailed jackrabbits averages 148 days and may run late February to mid July. Breeding in the northern Yellowstone ecosystem is not well documented.
- Feed on grasses, forbs, and shrubs at night and are less active during the day.
- Can run from 35 to 50 mph (56 to 80 kph) and cover six to ten feet (2–3 m) with each bound. Will also swim when being pursued by predators.

Jackrabbits are found as high as 14,600 feet (4,200 m) in Colorado, but a limiting factor in Yellowstone appears to be snow, which begins to accumulate earlier in the winter, attains greater depths, and lasts later into spring with increasing elevation.

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Staff Reviewer

Kerry Gunther, Bear Management Biologist

Snowshoe Hares

Lepus americanus

Number in Yellowstone

Common in some places.

Where to See

Norris Geyser Basin area.

Identification

- 14.5–20 inches long, weighs three to four pounds.
- Large hind feet enable easy travel on snow; white winter coat offers camouflage; gray summer coat.
- Transition in seasonal fur color takes about 70–90 days; seems to be triggered in part by day length.

Habitat

- Found particularly in coniferous forests with dense understory of shrubs, riparian areas with many willows, or low areas in spruce-fir cover.
- Rarely venture from forest cover except to feed in forest openings.
- Eat plants; use lodgepole pine in winter.
- Preyed upon by lynx, bobcats, coyotes, foxes, weasels, some hawks, and great horned owls.

Behavior

- Breed from early March to late August.
- Young are born with hair, grow rapidly, and are weaned within 30 days.
- Docile except during the breeding season when they chase each other, drum on the ground with the hind foot, leap into the air, and occasionally battle.
- Mostly nocturnal; their presence in winter is only advertised by their abundant tracks in snow.

Wolverines

A mid-size carnivore in the weasel family, the wolverine (*Gulo gulo*) is active throughout the year in cold, snowy environments to which it is well adapted. Its circumpolar distribution extends south to mountainous areas of the western United States, including the greater Yellowstone area where they use high-elevation islands of boreal (forest) and alpine (tundra) habitat. Wolverines have low reproductive rates, and their ability to disperse among these islands is critical to the population's viability. Climate-change models predict that by 2050, the spring snowpack needed for wolverine denning and hunting will be limited to portions of the southern Rocky Mountains, the Sierra Nevada range, and greater Yellowstone, of which only the latter currently has a population. Wolverines are so rarely seen and inhabit such remote terrain at low densities that assessing population trends is difficult and sudden declines could go unnoticed for years.

US FOREST SERVICE/GARDINER RANGER DISTRICT

Remote cameras, like the one that took this photo, were used to record wolverine activity at live traps during a collaborative study in the greater Yellowstone area from 2006 to 2009. Here, wolverine F3 revisits a live trap, which did not capture her, in 2008. Each trap was baited with a skinned beaver carcass obtained from Montana fur trappers and had a transmitter that signaled up to 18 miles when the trap was triggered.

Population

Commercial trapping and predator-control efforts substantially reduced wolverine distribution in the lower 48 states by the 1930s. Some population recovery has occurred, but the species has not been documented recently in major portions of its historic range. In the greater Yellowstone area, wolverines have been studied using live traps, telemetry, and aerial surveys. A group sponsored by the Wildlife Conservation Society has documented ranges that extend into Yellowstone National Park along the northwest and southwest boundary. A second group, which included researchers from the National Park Service, the US Forest Service, and the Northern Rockies Conservation Cooperative, which surveyed the eastern part of the park and adjoining national forest from 2006 to 2009, documented seven wolverines. The average annual range for the two monitored females was 172 square miles (447 km^2); for three males, it was 350 square miles (908 km^2). The other two males, both originally captured by the Wildlife Conservation Society, dispersed from west and south of the park: M557 established a home range north of the park in 2009; M556 became the first confirmed wolverine in Colorado in 90 years.

On March 5, 2022, a wolverine was photographed by a park visitor along the Northeast Entrance Road corridor. In recent years, NPS staff have documented individual wolverines annually through tracks and

Quick Facts

Number

2006–2009: seven documented in eastern Yellowstone and adjoining national forests (two females, five males). Since 2009, documentation of sightings by park staff constributes to a larger interagency monitoring effort.

Size and Behavior

- 38–47 inches long, 13–31 pounds.
- Opportunistic eaters. Eat burrowing rodents, birds, eggs, beavers, squirrels, marmots, mice, and vegetation (including whitebark pine nuts); chiefly a scavenger in winter, but has also been known to take large prey such as deer, elk, and moose.
- Active year-round, intermittently throughout the day.
- Breed April to October; one litter of two to four young each year. Females give birth in dens excavated in snow, under log jams and uprooted trees in avalanche chutes.
- Mostly solitary except when breeding.

Management Concerns

- Since 2013, the wolverine has fluctuated between being listed as threatened under the Endangered Species Act (ESA) to having no federal protections. A series of court cases over the last decade have resulted in restoration of ESA threatened status in 2023. Climate change and habitat fragmentation are chief threats to this species.

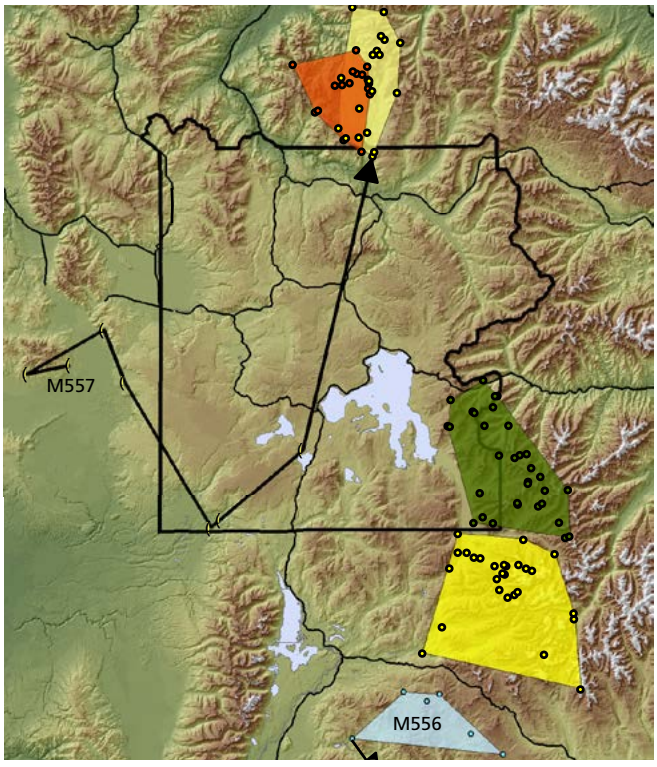
remote camera footage obtained from other wildlife monitoring programs.

Conservation Status

Wolverine populations in the US Rockies are likely to be genetically interdependent. Even at full capacity, wolverine habitat in the Yellowstone area would support too few females to maintain viability without genetic exchange with peripheral populations. The rugged terrain that comprises a single wolverine home range often overlaps several land-management jurisdictions. Collaborative conservation strategies developed across multiple states and jurisdictions are therefore necessary for the persistence of wolverines in the continental United States.

In 2013, USFWS proposed the wolverine be listed as "threatened" under the Endangered Species Act, only to reverse course the following year. Conservation groups challenged that reversal, and a judge found that the federal government failed to follow the best available science in its decision to not list the animals as threatened. In 2020, USFWS determined that federal protections were not warranted. ESA threatened status was officially restored in 2023.

Climate change impacts on wolverine habitat, specifically the likelihood of declining habitat in high elevation snowpack for denning females, had been identified as a chief threat to this species. Until recent years, wolverines could still be trapped in Montana which is home to the largest populations of wolverines in the lower 48 States. In 2019, however, the state closed trapping for this species.



Home ranges of five wolverines documented in 2009.

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Staff Reviewer

Dan Stahler, Senior Wildlife Biologist

Other Small Mammals

Badger (*Taxidea taxus*)

Identification

- 20–34 inches long, up to 26 pounds.
- Short and stout; long, curved claws.
- Grayish grizzled fur with dark legs and feet. Broad head forms a wedge. Sides of face are white with black patches, prominent white stripe extends down center of the nose .

Habitat/Diet

- Prefers open areas like grasslands and shrub-steppe. Most likely to be seen in Lamar Valley.
- Adapted to eat ground squirrels, pocket gophers, and other small burrowing rodents; will also eat birds, rabbits, mice, insects, and fish.
- Dig burrows in pursuit of prey, chasing prey into dead-end tunnels within burrows

Behavior

- Mostly solitary except in mating season (summer and early fall). Have delayed implantation; active gestation starts around February. May live up to 14 years.
- Excavated dens are used for daytime resting sites, food storage, and giving birth.
- May be inactive in their dens for up to 70 days in winter, but they are not true hibernators.
- Adults preyed on by mountain lions, bears, and wolves. Coyotes and eagles will prey on young.
- Known to hunt cooperatively with coyotes.

Golden-mantled Ground Squirrel (*Spermophilus lateralis*)

Identification

- 9–12 inches long, 7.4–11 ounces.
- Adult head and shoulders are reddish-brown, their "mantle."
- Often mistaken for a least chipmunk (described below); distinguished by larger size, more robust body, shorter tail, and stripes that do not extend onto the sides of the head.

Habitat/Diet

- Found throughout Yellowstone at all elevations in rocky areas, edges of mountain meadows, forest openings, tundra.
- 87% of diet consists of fungi and leaves of flowering plants; other foods include buds, seeds, nuts, roots, bird eggs, insects, and carrion.

Behavior

- Diurnal; hibernate October thru March to April (depending on elevation).
- Breeding occurs shortly after both males and females emerge from hibernation.
- Predators include coyotes, weasels, badgers, hawks, and grizzly bears.

Conservation Status

Unless otherwise noted, the conservation status of small mammals covered in this section is:

- Not listed federally. Not generally considered a species of conservation concern by Idaho, Montana, or Wyoming

Red Squirrel (*Tamiasciurus hudsonicus*)

Identification

- 11–15 inches long, 6.7–7 ounces.
- Brownish-red on its upper half; dark stripe above white ventral side; light eye ring; bushy tail.
- Quick, energetic.
- Loud, long chirp to advertise presence; much more pronounced in the fall.

Habitat/Diet

- Spruce, fir, and pine forests; young squirrels found in marginal aspen habitat.
- Eat conifer seeds, terminal buds of conifer trees, fungi, some insects; sometimes steal young birds from nests.

Behavior

- Breed February through May, typically in March and April; one litter of three to five young.
- Diurnal; do not hibernate; thus, territorialism ensures winter food supply.
- In fall, cuts cones from trees and caches them in middens, which are used for years and can be 15 by 30 feet; grizzlies search out these middens as food source of whitebark pine seeds.
- Preyed on by coyotes, grizzly bears, and hawks

Uinta Ground Squirrel (*Spermophilus armatus*)

Identification

- 11–12 inches long, weighs 7–10 ounces.
- Grayish back and rump with fine white spots on back; nose and shoulders are tan to cinnamon; tail is grayish underneath.

Habitat/Diet

- Found in disturbed or heavily grazed grasslands, sagebrush meadows, and mountain meadows up to 11,000 feet.
- Eat grasses, forbs, mushrooms, insects, and carrion (including road-killed members of its own species).

Behavior

- Hibernate as early as mid-July through March.
- Breed in early spring; one litter of six to eight young per year.
- Preyed on by long-tailed weasels, hawks, coyotes, badgers, and grizzly bears.
- During cool spring weather, Uinta ground squirrels are active at all times of day; as the weather warms, activity is more limited to morning, late afternoon, and evening.
- During winter, Uinta ground squirrels are sometimes active near the Albright Visitor Center and Mammoth Hot Springs Hotel.

Conservation Status

- Not listed federally. Not generally considered a species of conservation concern by Idaho or Wyoming. Montana has listed them as a Potential Species of Concern.

Least Chipmunk (*Tamius minimus*)

Identification

- 7.5–8.5 inches long, 1–1.9 ounces.
- Smallest member of the squirrel family; one of three chipmunk species in the park.
- Can be identified by quick, darting movements; seems to carry its tail vertically when moving.
- Often mistaken for golden-mantled ground squirrel; distinguished by smaller size, longer tail, and lateral stripes that extend onto the sides of the head

Habitat/Diet

- Prefer sagebrush valleys, shrub communities, and forest openings.
- Eat primarily plant material, particularly seeds and other fruits, but will also eat insects and fungi.

Behavior

- In Yellowstone, this species hibernates but also stores some food and may be somewhat active below ground during winter.
- Breeding begins as snowmelt occurs, usually late March until mid-May; one litter of five to six young per year.
- Preyed on by various hawks, weasels, foxes, and coyotes.

Short-tailed Weasel (Ermine) (*Mustela erminea*)

Identification

- 8–13 inches long, 2.1–7 ounces.
- Typical weasel shape: very long body, short legs, pointed face, long tail.
- Males about 40% larger than females.
- Fur is light brown above and cream below in summer; all white in winter except for tail, which is black-tipped all year.
- Compare to long-tailed weasel and marten.

Habitat/Diet

- Found in grassy and forested areas with abundant voles and mice, and in talus fields above treeline.
- Eat voles, shrews, deer mice, rabbits, rats, chipmunks, grasshoppers, and frogs.

Behavior

- Breed in early to mid-summer; one litter of six to seven young per year.
- Will often move through and hunt in rodent burrows.
- Competition with long-tailed weasels is believed to influence distribution and habitat use.

Long-tailed Weasel (*Mustela frenata*)

Identification

- 13–18 inches long, 4.8–11 ounces.
- Typical weasel shape: a very long body, short legs, pointed face, long tail.
- Fur is light brown above and buff to rusty orange below in summer; all white in winter, except for tail, which is black-tipped all year.
- Males 40% larger than females.
- Compare to marten and short-tailed weasel.

Habitat/Diet

- Found in forests, open grassy meadows and marshes, and near water.
- Eat voles, pocket gophers, mice, ground and tree squirrels, rabbits; to a lesser degree, birds, eggs, snakes, frogs, and insects.

Behavior

- Breed in early July and August; one litter of six to nine young per year.
- Solitary animals except during breeding and rearing of young.

Marten (*Martes americana*)

Identification

- 18–26 inches long, 1–3 pounds.
- Weasel family; short limbs and long, bushy tail; fur varies from light to dark brown or black; irregular, cream throat patch.
- Compare to long-tailed weasel and short-tailed weasel.

Habitat/Diet

- Found in conifer forests with understory of fallen logs and stumps; will use riparian areas, meadows, forest edges and rocky alpine areas.
- Eat primarily small mammals such as voles and red squirrels; also to a lesser extent birds, eggs, insects, fruit, berries, and carrion.

Behavior

- Solitary and territorial except in breeding season (July and August); have delayed implantation; young born in mid-March to late April.
- Active throughout the year; hunts mostly on the ground.
- Rest or den in hollow trees or stumps, in ground burrows or rock piles, in excavations under tree.
- Snow tracking shows that they occasionally "skydive"; when descending a tree, they will leap out from the tree from a height of several meters.

Montane Vole (*Microtus montanus*)

Identification

- 5–7.6 inches long, 1.2–3.2 ounces.
- Brownish to grayish-brown, occasionally grizzled; ventral side is silvery gray; relatively short tail is bi-colored.

Habitat/Diet

- Found at all elevations in moist mountain meadows with abundant grass and in grassy sagebrush communities; also common in riparian areas.
- Grass and forbs are their primary food.

Behavior

- Active year-round, maintain tunnels in winter; also dig shallow burrows.
- Typically breed from mid-February to November; up to four litters of two to ten young per year.
- Preyed on by coyotes, raptors, grizzly bears, other animals.

Pocket Gopher (*Thomomys talpoides*)

Identification

- 6–10 inches long, 2.6–6.3 ounces.
- Very small eyes and ears; brown or tan smooth fur; short tail; long front claws for burrowing; large, fur-lined pouches on either side of jaw for carrying food.

Habitat/Diet

- Found all over Yellowstone; only range restriction seems to be topsoil depth, which limits burrowing.
- Burrow systems are elaborate and often bi-level; can be 400–500 feet long.
- Snakes, lizards, ground squirrels, deer mice, and other animals use their burrows.
- Forage for forbs, some grasses and underground stems, bulbs, and tubers.

Behavior

- Transport food in cheek pouches to underground cache.
- Do not hibernate; instead burrow into the snow; often fill tunnels with soil, forming worm-like cores that remain in the spring after snow melts.
- Very territorial; only one per burrow.
- Preyed upon by owls, badgers, grizzly bears, coyotes, weasels, and other predators.

More Information, Other Small Mammals

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Staff Reviewers

John Treanor, Wildlife Biologist

Jessica Daley, Wildlife Health Program

River Otter (*Lontra canadensis*)

Identification

- 40–54 inches long; 10–30 pounds.
- Sleek, cylindrical body; small head; tail nearly one third of the body and tapers to a point; feet webbed; claws short; fur is dark, dense brown.
- Ears and nostrils close when underwater; whiskers aid in locating prey.

Habitat/Diet

- Most aquatic member of weasel family; generally found in riparian habitat near water.
- Eat crayfish, fish, frogs, turtles, small mammals, aquatic birds, and insects.

Behavior

- Active year-round. Mostly crepuscular but have been seen at all times of the day.
- Young born in March-April; mating occurs just after; have delayed implantation. Females and offspring remain together until next litter; may temporarily join other family groups.
- Can swim underwater up to 6 miles per hour and for 2–3 minutes at a time.
- Not agile or fast on land unless on snow or ice, then can move rapidly by alternating hops and slides; can reach speeds of 15 miles per hour.
- Can often be seen sliding on mud and snow and playing with sticks and rocks in the water.

Conservation Status

- Not listed federally. Not generally considered a species of conservation concern by Idaho or Montana. Wyoming has listed them as a Species of Greatest Conservation Need, categorizing their population status as Vulnerable.

Yellow-bellied Marmot (*Marmota flaviventris*)

Identification

- 20–28 inches long; 3.5–11 pounds.
- One of the largest rodents in Yellowstone.
- Reddish-brown upper body with guard hairs that are light; yellowish belly; small ears; prominent tail.

Habitat/Diet

- Found from lowest valleys to alpine tundra, usually in open grassy communities and almost always near rocks.
- Feed mostly on grasses, forbs, and seeds.

Behavior

- Hibernate up to 8 months, emerging from February to May depending on elevation; may estivate in June in response to dry conditions and lack of green vegetation and reappear in late summer.
- Breed within two weeks of emerging from hibernation; average five young per year.
- Active in morning, late afternoon, and evening.
- Colonies consist of one male, several females, plus young of the year.
- Vocalizations include a loud whistle (early settlers called them “whistle pigs”), a “scream” used for fear and excitement; a quiet tooth chatter that may be a threat.
- Males are territorial; dominance and aggressiveness demonstrated by waving tail slowly back and forth.
- Preyed on by coyotes, grizzlies, and golden eagles

Nearly 300 bird species have been sighted in Yellowstone, including raptors, songbirds, shorebirds, and waterfowl. About 150 species, like this Ruby-crowned kinglet, build nests and fledge their young in the park.

Birds

Records of bird sightings have been kept in Yellowstone since its establishment in 1872. These records document more than 300 species of birds to date, including raptors, songbirds, shorebirds, and waterfowl. Approximately 150 species nest in the park. The variation in elevation, terrains, and vegetative communities support habitats for a relatively high diversity of birds. Many of the birds are migratory species with approximately 50 species residing in the park year-round. There are currently no federally listed bird species known to breed in Yellowstone National Park.

The Yellowstone National Park bird program monitors a small portion of its breeding bird species to gather information on reproduction, abundance, and habitat use. Data are collected on multiple species from a wide variety of taxonomic groups and have been maintained for 40 or more years for several species. Long-term monitoring efforts help inform park staff of potential shifts in ecosystem function, e.g., climate change effects, for Yellowstone's bird community and may guide future conservation of the park's birds and their habitats.

Quick Facts

Number in Yellowstone
Approx. 330 documented species; approximately 150 species nest in the park.

Species of Concern
- Trumpeter swan
- Golden eagle
- Common loon

Current Management
The Yellowstone National Park bird program monitors the park's bird species, including species of concern. The program's core activities are monitoring raptors (bald eagles, ospreys, peregrine falcons, and golden eagles), wetland birds, and passerine/near passerine birds (songbirds and woodpeckers).

Climate Change

The timing of available food sources for birds may change with rising temperatures and changing weather patterns. Birds are sensitive to shifts in seasonal weather patterns and show a relatively rapid response to these fluctuations. For example, climate change has been shown to influence migration patterns, population size and distribution, the timing of reproduction, and nesting success for birds. Through monitoring, birds can be used as environmental health indicators to help managers detect changes in ecosystem function and, if necessary, take appropriate management action.

The Yellowstone bird program monitors the spring arrival of species to the park, as well as the timing of nest initiation and fledging for several raptor species, which may be useful in observing the effects of climate change in Yellowstone.

More Information

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FREQUENTLY ASKED QUESTION:

Where are good birding locations?

That depends on what kind of birds you want to see, the time of day you are looking, and your location in the park. In general, riparian areas and wetlands, especially those with shrubby willows, aspen, and cottonwoods, attract the greatest diversity and abundance of songbirds.

Hayden Valley is one of the best places to view water birds and birds of prey. Shorebirds feed in the mud flats at Alum Creek. Sandhill cranes often nest in the valley. Ducks, geese, and American white pelicans cruise the river. Bald eagles and osprey hunt for fish along the river; northern harriers fly low looking for rodents in the grasses. Great gray owls are sometimes seen searching the meadows for food (these birds are sensitive to human disturbance). Blacktail Ponds and Floating Island Lake, between Mammoth and Tower Junction, and the Madison River west of Madison Junction are also good places to look for birds.

Many birds, such as American robins and common ravens, are found throughout the park. Other species live in specific environments. For example, belted kingfishers are found near rivers and streams while Steller's jays are found in moist coniferous forests.

Spring is a good time to look for birds. Migration brings many birds back to the park from their winter journeys south; other birds are passing through to more northern nesting areas. Songbirds are singing to establish and defend their territories; and many ducks are in their colorful breeding plumages, which makes identification easier.

Watch for birds in the early morning from mid-May through early July. At all times, but especially during the nesting season, birds should be viewed from a distance. Getting too close can stress a bird (as it can any animal) and sometimes cause the bird to abandon its nest. As with all park wildlife, visitors should keep at least 25 yards away from birds and their nests.

Most birds migrate to lower elevations and more southern latitudes beginning in August. At the same time, other birds pass through Yellowstone. Hawk-watching can be especially rewarding in Hayden Valley late August through early October. In early November, look for tundra swans on the water.

Birds that can be viewed in Yellowstone year-round include the common raven, Canada goose, trumpeter swan, dusky grouse (formerly blue grouse), Canada jay, black-billed magpie, red-breasted nuthatch, American dipper, and mountain chickadee. A few species, such as common goldeneyes, bohemian waxwings, and rough-legged hawks, migrate here for the winter.

Visitors may report sightings with a bird observation form, available at www.nps.gov/yell/learn/nature/wildlife-sightings.htm and at visitor centers.

Please note: The use of audio bird calls is illegal in the park.

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Staff Reviewers

David Haines, Wildlife Biologist

Great horned owls are one of more than a dozen raptor (birds of prey) species in Yellowstone.

Raptors

The park supports 19 breeding raptor species, with additional species during migrations and seasonal movements. The park monitors bald eagles, golden eagles, ospreys, and peregrine falcons. Bald eagles and peregrine falcons were previously listed as endangered and threatened species, and the park has continued monitoring since their delisting. The osprey is monitored because of the decline of one of their primary food sources, the cutthroat trout in Yellowstone Lake. The park monitors golden eagles because they are affected by expanding energy development and increasing human activity across the United States. Other species that occur in the park, such as American kestrels and Swainson's hawks, are of growing conservation concern throughout their ranges in the United States.

Yellowstone Raptor Initiative

The Yellowstone Raptor Initiative was a five-year (2011–2015) program designed to provide baseline information for species not previously monitored, including golden eagles (*Aquila chrysaetos*), red-tailed hawks (*Buteo jamaicensis*), Swainson's hawks (*Buteo swainsoni*), American kestrels (*Falco sparverius*), prairie falcons (*Falco mexicanus*), and owls.

Surveys located 29 pairs of golden eagles, and it is likely that more breed within the park. Observed breeding success was low on average and is the subject of current research.

Researchers documented at least 60 red-tailed hawk territories across the northern range, with particularly high local density on the Blacktail Deer Plateau. Red-tailed hawks also exhibited variable breeding success that was, on average, much lower than the level thought necessary to maintain a stable population. Efforts to continue monitoring this species using citizen science are ongoing.

Swainson's hawks proved a difficult species to survey in Yellowstone. Most studies have focused on their association with agricultural land, and the park is a vestige of their native environment.

At least 17 species of raptor use Hayden Valley as a migration corridor, comparable to other migration sites in the Intermountain Flyway. The Initiative provided the first look at owl distribution and occurrence in the park. Ongoing surveys, will improve our knowledge and understanding of this under-studied group of raptors. Finally, while not monitored during this study, accipiters are of growing conservation concern, particularly American goshawks, and should be considered in future raptor studies.

Owls

Owl surveys continued after the completion of the Raptor Initiative in 2015, enabled by dedicated volunteers. Surveys provide an index of sites that attract advertising males of several northern forest owl species. Surveys in 2024 observed the highest abundance of northern saw-whet owls since surveys were initiated in 2013. Additionally, annual monitoring has revealed high year-to-year variation in abundance and diversity of species across the study area.

More Information

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Bald Eagles

The bald eagle (*Haliaeetus leucocephalus*) was named the national symbol of the US by Congress in 1782. Found near open water from Mexico to Alaska, bald eagles may range over great distances but typically return to nest in the vicinity where they fledged. In greater Yellowstone, they feed primarily on fish, but also on waterfowl and carrion. Numbers declined dramatically during most of the 1900s due to habitat loss, shooting, and pesticide contamination. In 1967, the US Fish and Wildlife Service listed the bald eagle as an endangered species in 43 states, including Idaho, Montana, and Wyoming. Habitat protection, restrictions on killing, and restrictions on pesticide use led to population growth and delisting of the species in 2007. Bald eagles nesting in northwestern Wyoming are part of the Rocky Mountain breeding population that extends into Idaho and Montana.

Bald eagles are a recovered endangered species.

Population

Bald eagles, which may reuse the same nest year after year, occupy territories near the park's major rivers and lakes. The number of eaglets that fledge each year depends partly on weather and can fluctuate widely. Juveniles may migrate west in the fall, but adults often stay in the park year-round. Historically, about half of the park's known bald eagle nests have been in the Yellowstone Lake area, where the productivity and success rates are generally much lower than in the rest of the park. In 2023, four occupied nests were detected on Yellowstone Lake. Parkwide, 31 territories were monitored, and occupied nests were detected at 13. Occupancy could not be determined at 13 of the 31 territories monitored. Five of the 13 occupied nests fledged a total of eight young, while six were unsuccessful and the outcome for the remaining two could not be determined.

Outlook

Research has shown that human presence can disturb eagle nesting and foraging; therefore, nest areas in national parks may be closed to visitors. Yellowstone manages nest sites on a case-by-case basis.

Bald Eagle Quick Facts

Number in Yellowstone

- In 2023, park staff monitored 31 bald eagle territories. Of 11 occupied nests where season outcome could be determined, five (45%) successfully fledged young.
- Eight young were produced. Productivity for occupied nests in 2023 (0.73 young per nesting female) was just above the long-term average (0.72).

Identification

- Large, dark bird; adult (four or five years old) has completely white head and tail.
- Females larger than males, as is true with most predatory birds.
- Immature bald eagles show varying amounts of white; they can be mistaken for golden eagles.

Habitat

- Bald eagles are usually found near water where they feed on fish and waterfowl. They also generally nest in large trees close to water.

Behavior

- In severe winters, eagles may move to lower elevations such as Paradise Valley, north of the park, where food is more available. On these wintering areas, resident eagles may be joined by migrant bald eagles and golden eagles.
- Feed primarily on fish and waterfowl, except in winter when fish stay deeper in water and lakes and rivers may be frozen. Then they eat more waterfowl. Eagles will also eat carrion in winter if it is available.
- Form long-term pair bonds.
- Some adults stay in the park year-round, while others return to their nesting sites by late winter.
- Lays one to three eggs (usually two) from February to mid-April.
- Both adults incubate the eggs, which hatch in 34 to 36 days.
- At birth, young (eaglets) are immobile, downy, have their eyes open, and are completely dependent upon their parents for food.
- Can fly from the nest at 10–14 weeks old.
- Some young migrate in fall to western Oregon, California, and Washington.

Golden Eagles

Golden eagles (*Aquila chrysaetos*) are large, long-lived raptors that feed on grouse, small mammals (e.g., rabbits, marmots, and ground squirrels), and carrion. Across the western US, and in Wyoming in particular, there are growing concerns about the status of golden eagle populations due to broad-scale energy development (wind, gas) and increasing human activity. To better understand the current population status and the drivers of population trends across the ecosystem, park biologists began focused study of golden eagles in Yellowstone in 2011.

Surveys have located 30 golden eagles territories inside the park. Twenty-two of the 30 territories are located in Yellowstone's Northern Range, the resulting density (one territory per 45.5 km2) is relatively high. Likewise, territory occupancy rates from 2011 to 2023 have been consistently high (100%). In contrast, low average productivity at these nests (0.32 young/occupied territory) is driven by both infrequent nesting attempts and low nest success. For example, in 2023, researchers monitored 23 occupied territories through the end of the breeding season; 12 occupied nests were detected and six were successful in fledging seven young. With such low productivity, the Yellowstone golden eagle population may be dependent on outside immigration, although much about the status of the park's golden eagle population remains unknown.

In other studies, reproductive failure of eagles and other raptors has been correlated with weather (e.g., high failure in high precipitation years), often interacting with food availability. Research in northern Yellowstone has found that prolonged precipitation, high snow pack, and severe weather events during winter and early spring have a negative effect on successfully fledging young.

Outlook

In response to broad concerns about golden eagle populations, Wyoming has initiated a golden eagle working group, and the US Fish and Wildlife Service has instituted a western US study modeling eagle habitat suitability, human development risks, lead exposure, and large-scale movements. Better understanding of the ecology of YNP eagles requires study of their food habits, toxicology, survival, and movement both within and outside the park. In recent years, extensive data relating to these key topics have been collected in two study areas flanking the park to the north and east, and complementary research within the park is ongoing.

Golden eagles are named for the yellow feathers at the base of the neck.

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Staff Reviewers

David Haines, Wildlife Biologist

Osprey

Like many other birds of prey, osprey (*Pandion haliaeetus*) populations declined due to pesticide use in the mid-1900s and rebounded in the latter part of the century, after the banning of pesticides such as DDT. The first study of osprey in Yellowstone National Park was conducted by M. P. Skinner, the park's first naturalist, in 1917. It was not until 1987 that the Yellowstone National Park bird program began monitoring breeding osprey annually, although an extensive survey on reproduction, diet, and habitat was conducted during the 1970s.

Ospreys are surveyed via fixed-wing aircraft and by ground-based surveys from May through August. During the survey flights, the majority of nests are monitored for occupancy and breeding activity. In addition, many suitable lakes and rivers are surveyed for potential new territories and nest sites.

Since monitoring began, Yellowstone's population of osprey has declined, particularly on and around Yellowstone Lake where currently no occupied territories are known. Nest success has remained relatively stable, with about 50% of nests producing one to two young per year.

Ospreys are monitored by park staff. In 2017, 27 active nests were monitored in Yellowstone.

Research

A recently completed study conducted by park biologists found a significant relationship between the declines in cutthroat trout and osprey reproduction at Yellowstone Lake. Recent increases in the number of young cutthroat trout caught by the Yellowstone fisheries program during the fall netting assessment are encouraging. An increase in cutthroat trout production may lead to an increase in nesting pairs of osprey and improved nesting success at Yellowstone Lake.

More Information

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Staff Reviewers

David Haines, Wildlife Biologist

Quick Facts

Number in Yellowstone

- In 2023, 27 active nests were monitored, of which 76% were successful, above the 37-year average (54%).
- Productivity for active nests in 2023 (1.36 young per nesting female) was also above the 37-year average (0.92).
- No osprey were detected nesting on Yellowstone Lake in 2023.

Identification

- Slightly smaller than the bald eagle.
- Mostly white belly, white head with dark streak through eye.
- Narrow wings, dark patch at bend.
- Fledglings have light edges to each dark feather on their backs and upper wing surfaces, which gives them a speckled appearance.

Habitat

- Dependent on fish for food, osprey are usually found near lakes (such as Yellowstone Lake), river valleys (such as Hayden, Madison, Firehole, and Lamar valleys), and in river canyons (such as the Gardner Canyon and the Grand Canyon of the Yellowstone River).

Behavior

- Generally returns to Yellowstone in April and leaves in September.
- Builds nest of sticks in large trees or on pinnacles close to water.
- Lays two to three eggs in May to June.
- Eggs hatch in four to five weeks.

Peregrine Falcons

The peregrine falcon is among the fastest birds, flying at up to 55 mph and diving at more than 200 mph when striking avian prey in mid-air. Peregrine populations began to decline in the 1940s because of pesticide contamination. One of three North American subspecies, the peregrine in Greater Yellowstone (*Falco peregrinus anatum*) was considered extirpated by the 1970s. As part of a national reintroduction program, captive-bred peregrines were released in Yellowstone and Grand Teton national parks during the 1980s. They typically reside in Greater Yellowstone from March through October, when their favored prey—songbirds and waterfowl—are most abundant. During winter, they may migrate as far south as Mexico or Central America.

TOM STANTON

Peregrine falcons are a recovered endangered species in Yellowstone.

History

In 1962, Rachel Carson sounded an alarm about the irresponsible use of pesticides with her landmark book, *Silent Spring*. Among the dangers she described were the adverse effects of chemicals—particularly DDT—on the reproductive capacity of some birds, especially predatory species such as the bald eagle and peregrine falcon. Her book raised public awareness of this issue, and was one of the catalysts leading to the United States banning some of the most damaging pesticides.

The peregrine falcon was among the birds most affected by the toxins. It was listed as Endangered in 1970. Yellowstone National Park was a site for peregrine reintroductions in the 1980s, which were discontinued when the peregrine population began increasing following restrictions on organochlorine pesticides in Canada and the United States, habitat protection, and the reintroduction program. The falcon made a comeback in much of its former range, and was delisted in 1999.

In Yellowstone, the most nesting pairs recorded was 32 in 2007, and they produced 47 fledglings. Although nesting pairs may reuse the same eyrie for many years, their remote locations on cliff ledges makes it impractical to locate and monitor activity at all eyries in a single year.

Yellowstone National Park's protected conditions and long-term monitoring of peregrines provide baseline information to compare against other populations in the United States. Continued monitoring is essential, not only for comparisons with other populations, but also because peregrine falcons and other raptors are reliable indicators of contaminants such as polybrominated diphenyl ether (PBDE), disease, and climate change. For example, to assess the levels

Quick Facts

Number in Yellowstone

- In 2023, park staff monitored 23 of the 42 known peregrine breeding territories. Twenty territories were occupied and occupancy could not be determined at the remaining three.
- Seven of 11 occupied nests fledged at least 12 young in 2023. Nest success was 41%, slightly lower than the 40-year average (75%).
- In 2023, average productivity was 0.71 young per occupied territory, lower than the 38-year average (1.7).

Identification

- Slightly smaller than a crow.
- Black "helmet" and a black wedge below the eye.
- Uniformly gray under its wings. (The prairie falcon, which also summers in Yellowstone, has black "armpits.")
- Long tail, pointed wings.

Habitat

- Near water, meadows, cliffs.
- Nests on large cliffs over rivers or valleys where prey is abundant.

Behavior

- Resident in the park March through October, when its prey—songbirds and waterfowl—are abundant.
- Lays three to four eggs in late April to mid-May.
- Young fledge in July or early August.
- Dives at high speeds (can exceed 200 mph/320 kph) to strike prey in mid-air.

of PBDE and other contaminants, scientists collect eggshell remains after peregrines have left their nests for the season.

Recovery in Yellowstone

While the organochlorines found in peregrine eggshell fragments and feather samples have declined significantly, several studies indicate that certain flame-retardant chemicals developed in the 1970s for use in electronic equipment, textiles, paints, and many other products leach into the environment and have been found in birds of prey at levels that impair their reproductive biology. In 2010, 2011, 2013, and 2014 eggshell fragments, feathers, and prey remains were collected from nest sites in Yellowstone after fledging occurred. Comparative data on eggshell thickness, which is an indicator of environmental contaminants, is within the range considered normal for the Rocky Mountain Region.

The major cause of peregrine endangerment is no longer a threat and Yellowstone's peregrine population appears stable. Productivity and nesting success in 2023 was well below the 40-year average of 1.7 and 74% respectively. Relatively low nesting success and productivity over the past decade warrants continued close monitoring of this species and may require further study to determine the cause(s).

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Staff Reviewers

David Haines, Wildlife Biologist

American white pelicans, sometimes mistaken for trumpeter swans at a distance, and other colonial nesting birds nest primarily on the Molly Islands in the southeast arm of Yellowstone Lake.

Wetland Birds

Approximately 30% of the bird species that breed in Yellowstone depend on wetlands. Scientists are concerned about these species because wetlands are expected to diminish as global and local temperatures increase. Yellowstone has years of data about the rate and success of nesting for some wetland species, but little information about changes in the timing of nesting activity—an indicator of climate change.

Colony Nesting Birds

Colonial nesting birds nest primarily on the Molly Islands in the southeast arm of Yellowstone Lake. These two small islands are cumulatively just 0.7–3.0 acres in size, depending on lake water levels, yet hundreds of birds have nested there in a single year.

Prior to the late 1970s, the Molly Islands were surveyed only intermittently. Some data go back to 1890 when nesting American white pelicans (*Pelecanus erythrorhynchos*) and California gulls (*Larus californicus*) were first noted in the area. Caspian terns (*Hydroprogne caspia*) are suspected of nesting on the Molly Islands as early as 1917, although information on breeding status was not collected until 1933. Double-crested cormorant (*Phalacrocorax auritus*) nests were confirmed by 1928.

Currently, American white pelicans, California gulls, and double-crested cormorants nest with varying rates of success. Photographic interpretation from three aerial surveys conducted June through August 2023, showed approximately 823 pelican nests that fledged an estimated 440 young. Thirteen nesting double-crested cormorants were successful in fledging 15 young. No California gulls or Caspian terns were observed on the islands.

Habitat

Birds nesting on the Molly Islands are subject to extreme environmental conditions ranging from flooding to frosts that can occur at any time of year to high winds. As a result, birds nesting there experience large year-to-year fluctuations in the number of nests initiated and fledglings produced. Populations of California gulls and double-crested cormorants have declined over the past 20 years. Caspian terns have not nested on the islands since 2005.

The reasons for the decline in colonial nesting birds are not well understood, but a previous study indicates that high levels of water in Yellowstone Lake are associated with low reproduction for nesting pelicans. Notably, quick spring melt-off events can cause a significant rise in the water level on Yellowstone Lake and flood the Molly Islands. Additionally, the introduction of lake trout to Yellowstone Lake has changed prey availability for species like the California gull and Caspian tern.

The decline in cutthroat trout, a known food source for the Molly Island colonial nesting birds, may also influence nesting success. Bald eagles on Yellowstone Lake that formerly depended on cutthroat trout may have switched prey to target the flightless and vulnerable young of these colonial nesting species. Observations of bald eagles perched on the islands during the nestling period is common.

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Staff Reviewers

David Haines, Wildlife Biologist

Common Loons

The majority of the Greater Yellowstone Ecosystem's (GYE) breeding common loon (*Gavia immer*) population occurs in Yellowstone and is one of the most southerly breeding populations in North America. The common loon is listed as a Species of Special Concern in Wyoming because of its limited range, small population, sensitivity to human disturbance, and loss of breeding habitat outside of Yellowstone. The GYE's breeding loon population is isolated from populations to the north by more than 200 miles, limiting immigration from other populations. The Yellowstone Loon population appears stable; however, detailed data from a study initiated in 2012 indicate that the number of loons present in the park can vary from year to year. Continuing research will try to analyze any trends in productivity, nesting success, and number of breeding pairs to attempt to determine why some years are more productive than others.

The common loon is a species of concern in Yellowstone.

Population

In 2023, cooperating biologists and park staff identified 23 occupied territories throughout the GYE, 18 of which were located within YNP. In total, the park housed 38 adult loons. Twelve pairs attempted to nest, and four of those failed. The eight successful pairs produced 10 loonlets during 2023.

Quick Facts

Number in Yellowstone

- In 2023, 38 loons in total. 12 territorial pairs. Eight successful nests produced 10 young.

Identification

- Breeding adults (March–October) have black and white checkering on back, a black bill, red eyes, and iridescent green head and neck. The neck has a black and white chinstrap and distinctive collar.
- Loon chicks hatch with a blackish-brown down and a white belly and retain this plumage for two weeks. Body feathers emerge at 4½ weeks on the chick's upper back. By six weeks, brown down remains only on the neck and flanks.
- Gray juvenile plumage is present at seven weeks.
- Juveniles and winter adults have dark upperparts and white underparts.

Habitat

- Summer on ponds or lakes: large lakes, such as Yellowstone, Lewis, and Heart lakes; and smaller ones such as Grebe and Riddle lakes.
- Winter on open water.
- May be found foraging or resting on larger, slow-moving rivers.
- Nest sites are usually on islands, hummocks in wetlands, or floating bog mats.
- Pairs nesting on lakes smaller than 60 acres usually require more than one lake in their territory. Lakes smaller than 15 acres are rarely used.

Behavior

- Primarily eat fish (4–8 inches).
- Unable to walk on land.
- Migrate in loose groups or on own, not in organized flocks. Arrive at summer lakes and ponds at or soon after ice-off.
- Four common calls: wail—for long-distance communication; yodel—used as a territorial signal by males only; tremolo—a staccato call, usually by an agitated adult; and hoot—a contact call, often between adults or adults and their young.
- Females generally lay two eggs, typically in June.
- Males and females share incubation duties equally. Chicks hatch after 27–30 days. Both adults also care for their young.
- Chicks are able to fend for themselves and attain flight at 11–12 weeks.
- In late summer, adults form social groups, especially on larger lakes, before leaving in October.

Management Concerns

- The breeding population in Wyoming is isolated; populations to the north are more than 200 miles away.
- Loons can be bioindicators of the aquatic integrity of lakes, responding to lead and mercury levels.
- Not all factors affecting loon reproduction in Yellowstone are known, but human disturbance of shoreline nests has a negative impact.

Distribution

In the western United States, common loons breed in Idaho, Montana, Washington, and Wyoming. The total western US breeding population is estimated at 90 territorial pairs. In 2023, Yellowstone National Park hosted 60% of the GYE's total loon population and 57% of the breeding pairs. Furthermore, YNP loons produced 63% of the ecosystem's fledged chicks, highlighting the park's important role in regional loon population stability and persistence. Western populations of breeding common loons are known to overwinter from Washington south to California. Spring and fall migrants in Wyoming represent breeding populations from Saskatchewan that overwinter around Mexico's Baja California peninsula.

Outlook

There are several threats to Wyoming's loon populations. Direct human disturbance to shoreline nests and chicks lowers survival rates and adversely affects numerous loon territories in YNP each year. Increased outreach to the public to minimize shoreline disturbance could help improve the long-term outlook for loons within the park. Throughout YNP and Wyoming, the loss of breeding habitats and water level fluctuations (e.g., erratic spring flooding) also impact loon nest success and productivity.

Contaminants like lead (from sinkers) and mercury, in combination with hazards on wintering grounds (e.g., marine oil spills and fishing nets) challenge loon reproduction and survival even further. Visitors to Yellowstone's lakes can help minimize disturbance of loon nests by staying on trails during the breeding season, avoiding shorelines, and, as with all wildlife species, giving adult and fledgling loons plenty of space.

On average, one loon is killed per year on Yellowstone Lake by gill nets as bycatch in the park's effort to remove invasive lake trout. Ongoing research will better assess patterns in gillnetting mortalities to improve coordination with fisheries crews, thereby reducing the threat to local loons while allowing for continued lake trout removal.

Fish are the primary prey of loons. As part of a multi-park study on mercury concentration in fish, fish from various lakes where loons nest were screened for mercury. Fish were sampled from Beula, Grebe, Yellowstone, and Lewis lakes. Fish from Beula, Grebe, and Yellowstone lakes exceeded the threshold at which fish-eating birds may be affected by mercury toxicity. Fish from Lewis did not exceed that threshold, although they still contained mercury.

Loons can live up to 30 years, have relatively low chick production, and are poor colonizers to new breeding areas. Given the very small size and isolation of Wyoming's breeding loon population, it is at a particularly high risk of local extinction.

More Information

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Staff Reviewers

David Haines, Wildlife Biologist

Trumpeter Swans

The trumpeter swan (*Cygnus buccinator*), named for its resonant call, is North America's largest wild waterfowl, with a wingspan of up to eight feet. These swans require open water, feed mainly on aquatic plants, and nest in wetlands. Although they once nested from Alaska to northern Missouri, trumpeter swans were nearly extirpated in the lower 48 states by 1930 due to habitat loss and hunting. A small population of approximately 70 birds survived in the Greater Yellowstone Ecosystem. With intensive management, this population provided the basis for widespread swan recovery later in the century.

As a result of conservation measures, populations across the continental United States began increasing. As of 2015, there are approximately 63,000 trumpeter swans in North America belonging to three distinct subpopulations: the Pacific, the Rocky Mountain, and the Interior. Swan numbers in the Greater Yellowstone Ecosystem, belonging to the Rocky Mountain subpopulation, grew steadily through the early 1960s, after which cygnet production in Yellowstone and subsequent recruitment of adults into the breeding population began declining.

Population

The park's resident trumpeter swan population increased after counts began in 1931 and peaked at 72 in 1961. The number began declining shortly after and dropped further after the Red Rock Lakes National Wildlife Refuge feeding program ended and winter ponds were drained in the early 1990s. Other factors contributing to the decline may include predation, climate change, and human disturbance. In 2023, park biologists observed 29 trumpeter swans in Yellowstone, including 26 adults and 3 cygnets. Five pairs attempted to nest in the park, and four of the five pairs hatched 12 cygnets. However, only one territory was successful in fledging three cygnets. Other apparent pairs were observed throughout the park but no other nesting was detected.

A pair of trumpeter swans successfully fledged four cygnets (young) on Grebe Lake in 2012.

Eight young trumpeter swans were released in Yellowstone in 2023 in Hayden Valley on the Yellowstone River, near the confluence with Alum Creek. Staff hope that these released swans will become bonded to their release location and return the following spring. In total, the park has released 64 cygnets over a 11-year period. At least two territories have one or more individuals that were released in previous years.

Swans typically take at least four years to reach sexual maturity, so biologists are hopeful more of these young birds may breed in coming years. The release program is part of an ongoing effort to augment

Quick Facts

Number in Yellowstone
29 resident swans in 2023, including five breeding pairs.

Trumpeter swans are increasing in the Rocky Mountains, stable in the Greater Yellowstone Ecosystem, but have declined in Yellowstone National Park since the early 1960s.

Identification
- White feathers, black bill with a pink streak at the base of the upper mandible.
- During migration, can be confused with the tundra swan. Trumpeters are larger and have narrower heads, a pink mandible stripe, and lack a yellow spot in front of the eye.

Habitat
- Slow-moving rivers or quiet lakes.
- Nest is a large, floating mass of vegetation.

Behavior
- Feed on submerged vegetation and aquatic invertebrates.
- Low reproduction rates.
- Can fail to hatch eggs if disturbed by humans.
- Lay four to six eggs in June; young (cygnets) fledge in late September or early October.
- Usually in pairs with young in summer; larger groups in winter.

Management Concerns
- Limiting factors in Yellowstone appear to be flooding of nests, predation, possibly effects of drought caused by climate change, and less immigration into the park from outside locations.
- Because swans are sensitive to human disturbance during nesting, nest areas are closed to public entry.

Yellowstone's swan populations and increase the number of breeding pairs that nest inside the park.

Nearly all Rocky Mountain trumpeter swans—including several thousand that migrate from Canada—over-winter in ice-free waters in the Greater Yellowstone Ecosystem, but only a portion of them remain here to breed.

The best available scientific evidence suggests that Yellowstone provides marginal conditions for nesting and acts as a sink for swans dispersing from more productive areas. This effect has been compounded in recent decades by reduced wetland areas (due to long-term drought or warmer temperatures) and community dynamics (e.g., changes in bald eagle diets due to the limited availability of cutthroat trout in Yellowstone Lake). Trumpeter swan presence in the park is currently limited to a small local population of residents and wintering migrants from outside the park. Concern about the Greater Yellowstone Ecosystem population has resulted in cooperative efforts between state and federal agencies to monitor swan distribution and productivity.

Across the region, federal agencies currently survey swans in September to estimate the resident swan population and annual number of cygnets produced.

Outlook

Trumpeter swans are particularly sensitive to human disturbance. Because of this, park managers restrict human activity in known swan territories and nesting areas. With a low count of four adult birds in 2009 to 26 adults and five breeding pairs in 2023, these restrictions on human activity during nesting and the release of cygnets into this local population are now beginning to show a positive response. The total number of birds observed in Yellowstone today mirrors numbers that have not been seen since the mid-1990's. Further, efforts to protect and increase the resident swans in the park along with a better understanding of habitat quality will help to determine the future of this iconic Yellowstone species.

Trumpeter swans are a species of concern in Yellowstone.

Current nesting range of trumpeter swans.

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Staff Reviewers

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Songbirds, such as this mountain chickadee, and woodpeckers comprise the majority of bird species in Yellowstone National Park.

Songbirds and Woodpeckers

Songbirds and woodpeckers, or passerine and near passerine species, comprise the majority of bird species in Yellowstone National Park. They are monitored through counts in willow stands, recently burned forests, mature forests, and grasslands/sagebrush steppe; the North American Breeding Bird Survey; fall migration surveys; and a summer and early fall banding station.

Willows

Willow stands are one of a few deciduous wetland habitats in the Greater Yellowstone Ecosystem. Bird diversity is considerably higher in wetland habitats than in grasslands, shrublands, and upland coniferous forests. Several Yellowstone bird species, including Wilson's warbler (*Cardellina pusilla*), willow flycatcher (*Empidonax traillii*), and gray catbird (*Dumetella carolinensis*), only breed in willow communities.

From the early 1900s, growth of willows and other woody vegetation on Yellowstone's northern range was stunted (suppressed) by elk browsing, reduced beaver populations, consumption by fire, and/or climate change. Correlated with the recovery of several large predator species in the park, some willow stands in the northern range have grown taller and thicker since the mid-1990s, creating a range of growth conditions in current willow stands.

Monitoring of willow–songbird communities in Yellowstone began in 2005. Scientists compare the presence and abundance of breeding songbirds across different willow stand conditions. In 2023, park staff recorded 37 songbird species in willows. Species richness (diversity) and average songbird abundance was higher in taller than in suppressed willows. Recovered willow stands provide shrubby cover for ground- and low-nesting species such as song sparrows. Suppressed willows appear to provide habitat for generalist and grassland/sagebrush species. Willow stands are slowly changing and biologists plan to regularly reassess the vegetation characteristics as bird communities continue to be monitored.

Mature Forests

While the importance of mature and old growth forests to songbirds is poorly understood, mature forests notably provide nesting habitat and foraging opportunities for many species that young stands do not. Climate warming may cause more frequent and severe fires in Yellowstone National Park, which could disproportionately impact mature forest stands that, by definition, take longer to regenerate post-burn.

Due to the potential loss of this habitat type as the climate changes, park biologists initiated songbird surveys in three mature forest types in 2017 to document the bird communities that currently use them. No surveyed forests had a major disturbance (i.e., wildfire) in at least 100 years, although forest structure and tree species composition varied. In 2022, observers recorded 19 species and the most abundant species were pine siskin (*Spinus pinus*), mountain chickadee (*Poecile gambeli*), American robin (*Turdus migratorius*), ruby-crowned kinglet (*Regulus calendula*), yellow-rumped warbler (*Setophaga coronata*), and dark-eyed junco (*Junco hyemalis*). Species richness increased with forest complexity from 10 species in lodgepole-dominated and mixed lodgepole-spruce forests to 15 species in Douglas fir and spruce.

Burned Landscapes

Birds are among the first returning vertebrates to forests affected by fire. Birds that nest in cavities of trees depend on forest fires to provide their habitat—and different species depend on different effects of forest fires. For example, black-backed (*Picoides*

Three-toed woodpeckers nest in trees that burned in low to moderately severe fires, and hunt for the beetles in the bark.

arcticus), American three-toed (*P. dorsalis*), and hairy (*P. villosus*) woodpeckers use trees that burned in low to moderately severe fires, two to four years after the fire. Northern flickers (*Colaptes auratus)* move into severely burned areas three years after a fire. Standing dead trees left behind after a fire attract bark and wood-boring beetles—primary prey for woodpeckers. Nest cavities created by woodpeckers are later used by chickadees, nuthatches, bluebirds, owls, and some species of duck.

Because fire size, frequency, and intensity are expected to increase with climate change, scientists are studying how the different bird species use different types of post-burn forests and they are developing monitoring methods for the future.

Grasslands/Sagebrush Steppe

Grasslands are a threatened habitat type across the continent and grassland songbirds are the most imperiled songbird guild in North America. In Yellowstone, grasslands and sagebrush steppe are impacted by invasive plants, changing intensities of ungulate grazing, and climate change. In 2022, bird program staff and volunteers conducted songbird surveys in sagebrush steppe and grasslands across the northern range, in areas that vary in bison grazing intensity as well as native and invasive plant species composition.

Staff observed 15 species of songbird in grasslands and sagebrush steppe in 2022. In areas with high grazing intensity and abundant non-natives, the most abundant species were horned lark (*Eremophila alpestris*), vesper sparrow (*Pooecetes gramineus*), and Brewer's blackbird (*Euphagus cyanocephalus*). At other sites, species diversity varied significantly, although Brewer's sparrow (*Spizella breweri*), vesper sparrow (*Pooecetes gramineus*), and savannah sparrow (*Passerculus sandwichensis*) were all common.

Breeding Bird Surveys

North American Breeding Bird Surveys (BBS) are a continent-wide monitoring effort coordinated by the US Geological Survey, the Canadian Wildlife Service's Research Center, and Mexico's National Commission for the Knowledge and Use of Biodiversity (CONABIO). Since the 1980s, Yellowstone National Park has participated in these long-term surveys conducted throughout North America. The surveys are road-based with the registered observer recording all birds seen and heard within a quarter mile radius; survey points occur every half mile. Surveys are conducted in June, during the height of the songbird breeding season, and occur on three routes: Mammoth (Indian Creek to Tower Junction), Northeast Entrance (Tower Junction to Round Prairie), and the Yellowstone route (Dunraven Pass to Mary Bay).

In 2022, surveyors detected 3,464 individuals of species. The greatest overall bird abundance was observed along the Yellowstone route through the interior. Large flocks of Canada geese along the Yellowstone River accounted for 79% of all observations along the interior route. Canada goose numbers were relatively stable from 1987 to 2010, after which they increased substantially.

Fall Migration

Fall migration represents an important and vulnerable part of the annual cycle for many songbirds. As they make the long journey south to winter range, migrating songbirds must find appropriate places to rest and refuel. During this season, the songbird community within Yellowstone National Park changes, accommodating species and individuals who do not breed here but are just passing through. In addition to breeding-season efforts, bird program staff monitor autumn songbirds in willow stands, mature forest, and grassland/sagebrush steppe to better document patterns in habitat use by fall resident and migrating passerines.

Songbirds, particularly migrants, were most abundant and diverse in willows in the fall, consistent with

patterns seen during the breeding season. In sagebrush steppe, migrants were more frequent and more diverse than resident songbirds, while mature forest largely provided fall habitat for resident species. Dark-eyed juncos were the most common fall songbird species in willows as well as in mature forest. In grasslands and sagebrush steppe, Brewer's blackbirds were the most commonly observed species. These fall surveys help highlight the year-round importance of Yellowstone to the resident and migrant avian community.

Banding Station

While songbird counts can provide good estimates for songbird diversity and abundance, they do not provide any information about measures of demography, i.e., reproduction and survival. To improve our understanding of songbird demography in the park, the bird program began annual operations of a mist-netting and songbird banding station in 2018, located in a willow-lined riparian corridor on the northern range. During the breeding season, researchers participated in the international MAPS (Monitoring Avian Productivity and Survivorship) program, operated by the Institute for Bird Populations. To help assess use of riparian habitats by juvenile and migrating songbirds, staff continued banding operations into the fall, through late September.

In 2023, staff captured 232 new birds belonging to 30 different species during the breeding season. One hundred ten individual birds banded between 2018 and 2023 have been recaptured at least one time since banding was initiated. The most commonly captured species during the breeding season are yellow warbler (*Setophaga petechia*) and warbling vireo (*Vireo gilvus*).

Biological technicians take vital statistics and measurements from a Yellow warbler while fitting the bird with a band.

Continued netting and banding efforts in future years will provide additional demographic information that will help researchers better understand songbird population dynamics within the park.

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Staff Reviewers

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American avocets are one of the nearly 300 bird species found in Yellowstone National Park. These shorebirds sweep their upturned bills back and forth through shallow water to collect aquatic invertebrates.

Other Notable Birds

American Dippers

The dark-gray American dipper *(Cinclus mexicanus)* bobs beside streams and rivers. Also called the water ouzel, the dipper dives into the water and swims in search of aquatic insects. Thick, downy feathers made waterproof with oil from a preen gland enable this bird to thrive in cold waters.

Ravens

Several members of the Corvid family (jays, crows, and ravens) live in Yellowstone, including the common raven (*Corvus corax*). Common ravens are smart birds, able to put together cause and effect. Ravens are attracted to wolf kills and may follow wolves while they hunt elk. Wolves also provide better access to carrion, as ravens are not able to rip open thick skin on their own. Ravens are willing to eat almost anything and are frequently seen near parking lots searching for food. Do not feed them.

Recent surveys indicate 200–300 ravens are present in the northern range of Yellowstone and 53% of those are in wolf habitat, away from human areas. Before wolf reintroduction, nearly 74% of ravens likely used human areas. Researchers are further investigating seasonal and spatial patterns in raven habitat use, and ravens' relationships with humans and wolves by monitoring raven movements using satellite transmitters.

Clark's Nutcrackers

Clark's nutcracker (*Nucifraga columbiana*) is common throughout Yellowstone. Nutcrackers are important seed dispersers for many western conifers and are the primary disperser for whitebark pine (*Pinus albicaulis*). Whitebark pine seeds are the preferred food resource for nutcrackers and the two species are heavily dependent on one another. Whitebark pine prevalence is threatened throughout the west, including the park due to infestations of mountain pine beetle, white pine blister rust, and a changing climate and fire regime. To track nutcrackers' response to projected declines in whitebark pine, researchers are monitoring nutcracker populations, habitat and food selection.

Sandhill Cranes

Sandhill cranes (*Grus canadensis*) nest in Yellowstone each summer. Because their gray feathers blend in well with the grassland habitat, their guttural calls announce their presence long before most people see them. The tallest birds in Yellowstone, they stand about four feet (1.2 m) high. They have a wingspan of approximately 6.5 feet (2 m) and are often mistaken for standing humans or other animals at a distance.

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JAY FLEMING

Yellowstone cutthroat trout are found in Yellowstone National Park and are a keystone species. They provide an important source of energy for many species of birds and mammals.

Native Fish Species

Yellowstone has 11 fish species native to its lakes and streams. Native sport fish include two species of cutthroat trout, Arctic grayling, and mountain whitefish. Yellowstone's native fish underpin natural food webs, have great local economic significance, and provide world-class visitor experiences.

Yellowstone Cutthroat Trout

Yellowstone cutthroat trout (*Oncorhynchus virginialis bouvieri*, YCT) are the most widespread native trout in the park and the dominant fish species. They provide an important source of food for an estimated 16 species of birds and mammals including bald eagles, grizzly bears, and river otters.

Some populations live and spawn within a single stream or river (fluvial), some live in a stream and move into a tributary to spawn (fluvial-adfluvial), some live in a lake and spawn in a tributary (lacustrine-adfluvial), and still others live in a lake and spawn in an outlet stream (allacustrine). Life history diversity within an ecosystem helps protect a population from being lost in a single extreme natural event.

Genetically unaltered YCT populations have declined throughout their natural range in the Intermountain West due to competition with and predation by nonnative fish species, a loss of genetic integrity through hybridization, habitat degradation, and angling harvest. Many of the remaining genetically unaltered YCT are found within the park. State and federal wildlife agencies classify YCT as a sensitive species. However, the US Fish and Wildlife Service concluded that YCT does not warrant listing as a threatened species under the Endangered Species Act.

The YCT population in the Yellowstone Lake ecosystem was abundant in the 1980s. Nonnative lake trout caused a dramatic decline in YCT in the early 2000s. Strong suppression efforts have reduced lake trout numbers allowing YCT numbers to increase. Although YCT numbers are still below target, the fish are making a comeback and currently are much greater in size than when population numbers were much higher. An adult YCT now weighs twice what one did in the 1970s, probably because of reduced competition with other YCT. As the population continues to increase in numbers, and competition increases, this will likely change.

Two-thirds of the streams that were part of the species' native habitat outside the Yellowstone Lake watershed still contain genetically unaltered YCT, but in many others, they have hybridized with rainbow trout, or are in competition with brook or brown trout..

Description

- Red slash along jaw.
- Body mostly yellow-brown with darker olive or gray hues on the back, lighter yellow on sides.
- Highly variable black spotting pattern, but few to no spots on the head.

Behavior

- Spawn in rivers or streams from late April until mid-July.
- Most important foods are aquatic insects—mayflies, stoneflies, caddisflies, etc.—and other small aquatic animals, plus terrestrial insects that fall into the water. Leeches, amphipods, worms, and small aquatic invertebrates such as water fleas and copepods are important foods in Yellowstone Lake.

- Also eat smaller fish, fish eggs, small rodents, frogs, algae and other plants, and plankton.

Distribution

- Native to the Yellowstone River, Snake River, and Falls River drainages.
- Require cold, clean water in streams or lakes.

Westslope Cutthroat Trout

Westslope cutthroat trout (*Onchorhynchus lewisi*, WCT) are the most widely distributed species of cutthroat trout in the U.S. but have undergone range-wide declines. Genetically pure WCT were thought to have been extirpated from their native range in Yellowstone National Park in the Gallatin and Madison river drainages due to hybridization with nonnative rainbow trout and YCT stocked outside of its historic range, and competition with nonnative brook trout and brown trout. However, two populations of genetically pure WCT were discovered in the early 2000s in Last Chance Creek, an indigenous WCT population, and in Oxbow/Geode Creek complex, containing WCT descendants from "cutthroat trout" stocking events in the Yellowstone River drainage before different cutthroat trout species were widely recognized. Conservation actions by the National Park Service and its partners have restored and expanded WCT to nearly 70 stream miles and 280 lake acres, including, Goose, High, Grebe, and Wolf lakes.

Description

- Red slash along jaw and dark spots.
- Greenish gray in color.
- Larger, irregular spots more numerous around tail, forming an arched pattern above lateral line toward gills and head.
- Crimson streak above the belly.
- Some have white leading edges on pelvic and pectoral fins (unlike genetically pure YCT).
- Sometimes mistaken for rainbow trout.

Behavior

- Fluvial and lacustrine life histories.
- Spawn in rivers or streams in late May through mid-July.
- Most important foods are aquatic insects such as mayflies, stoneflies, caddisflies, dragonflies, damselflies, and terrestrial insects that fall into the water. Leeches, amphipods, worms, and small aquatic invertebrates such as copepods and zooplankton are important foods in lakes.

Westslope cutthroat trout

Distribution

- Last Chance Creek, Oxbow/Geode Creek complex
- Goose, High, Grebe, and Wolf lakes.
- East Fork Specimen Creek, Grayling Creek, Gibbon River upstream of Virginia Cascades
- Hybridized populations exist throughout the Gallatin and Madison river drainages.

Arctic Grayling

Arctic grayling (*Thymallus arcticus*, grayling) historically existed in the contiguous U.S. in two disjunct groups in Michigan and Montana/Wyoming. The Michigan group was extirpated in the 1930s and the Montana/Wyoming group has undergone drastic declines. In Yellowstone National Park, grayling historically occupied fluvial habitat in the Gallatin and Madison river drainages, including the lower Gibbon and Firehole rivers, and Grayling Creek. However, fluvial grayling were extirpated from streams and rivers in the park by the mid-1900s, presumably resulting from nonnative fish introductions and habitat degradation with the construction of Hebgen Reservoir in 1915.

The only known grayling populations left in the park were descendants of grayling with the lacustrine life history that is nonindigenous to Yellowstone National Park that were stocked in Cascade and Grebe lakes and did not establish in riverine habitats. From 2017–2021, the National Park Service implemented a grayling and WCT conservation project in the upper Gibbon River drainage. Biologists removed nonnative rainbow trout and the lacustrine-sourced grayling, and stocked more than 100,000 WCT embryos and fish, and 170,000 fluvial-sourced grayling

Arctic grayling

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Mountain whitefish

fry. An additional 7,000 grayling fry were stocked in Grebe Lake in 2023.

From 2015–2017, the National Park Service also reintroduced nearly 60,000 WCT embryos and fish, and 110,000 fluvial-sourced grayling embryos and fry to upper Grayling Creek in the Madison River drainage.

Description

- Large sail-like dorsal fin.
- Large scales, silver in color.
- Dark spots on the front half of body.
- Black throat slash.
- Sometimes confused with mountain whitefish.

Behavior

- Fluvial ancestry. A fluvial grayling source was used in conservation projects to increase the likelihood that grayling will populate riverine habitat. Grayling with fluvial ancestry stocked in lakes have exhibited lacustrine life-history behaviors.
- Spawn in rivers and streams from mid-May to late-June.
- Similar to trout, they eat true flies, caddisflies, macroinvertebrates, and small crustaceans. Younger, smaller fish feed on zooplankton.

Distribution

- Cascade, Ice, Grebe, and Wolf lakes.
- Gibbon River upstream of Virginia Cascades.
- Occasionally reported in Grayling Creek and, lower Gibbon, Madison and Firehole rivers.
- Require clear, clean, and cold water.

Mountain Whitefish

The mountain whitefish (*Prosopium williamsoni*) is a slender silver fish, sometimes confused with Arctic grayling. It lives in Yellowstone's rivers and streams and requires deep pools and clear, clean water. This species is very sensitive to pollution. The mountain whitefish has persisted in its native waters, unlike the Arctic grayling. Mountain whitefish are commonly caught by anglers in most of the park's large rivers. They are less common in smaller streams.

Description

- Silver or olive green to dark gray. No spots.
- Body nearly round on cross-section.
- Small mouth with no teeth.

Behavior

- Spawns in fall.
- Generally, feeds along the bottom, eating aquatic insect larvae, and competes with trout for the same food.

Distribution

- Heart Lake and its tributaries.
- The Yellowstone River below the Lower Falls, Gardiner, Gibbon, Madison, Snake, and Lewis rivers and Middle Creek.

Rocky Mountain Sculpin (*formerly Mottled Sculpin, pending confirmation*)

The Rocky Mountain sculpin (*Cottus bondi*) lives primarily in shallow, cold water throughout Yellowstone, including the Yellowstone River downstream of the Lower Falls. It has modified pectoral and pelvic fins to help it move and grip the bottom of the stream. It lacks scales and a swim bladder. It eats small insects, fish, and fish eggs, and is consumed by trout.

Description

- Coloration is a combination of bars, spots, and speckles randomly distributed.
- Large banded pectoral fins
- Dorsal fin contains soft spines, and just barely joins with the second dorsal.
- Maximum length is 6 inches.

Behavior

- Feeds primarily on aquatic insect larvae. Also eats crustaceans, small fish, fish eggs, and some plant material.
- Preyed upon by other fish, notably trout.
- Favored habitat is well-oxygenated and clear water, such as over gravel riffles in mountain streams, springs, and along rocky lake shore.
- Spawns during early winter and late spring.

Distribution

- Widely distributed in drainages throughout the park.

Utah Chub

The Utah chub (*Gila atraria*) is the largest of the minnows (12 inches) and has a robust round body. It is native to the Snake River drainage and abundant in Heart Lake and the Heart River. They have a high reproductivity capacity with a 12-inch female carrying up to 90,000 eggs. Utah chub prefer slow, warm waters with abundant aquatic vegetation.

Redside Shiner

The Redside shiner (*Richardsonius balteatus*) is a species of minnow most often found in lakes along the shallow margins. It is native to the Snake River drainage but has been introduced to Yellowstone Lake where it is now common.

Longnose Dace

The longnose dace (*Rhinichthys cataractae*) has an elongated, rounded body that tapers towards the head and tail. It grows to about 6 inches and is often found behind rocks and in eddies of cold, clear waters of the Yellowstone, Snake, and Madison river drainages. It can also be found in Yellowstone Lake. Longnose dace will feed on aquatic insects, aquatic vegetation, or algae.

Longnose sucker

Speckled Dace

The speckled dace (*Rhinichthys osculus*) is found in the Snake River drainage. It is similar in body form and size to the Longnose dace but has a much smaller distribution. Interestingly, the Speckled dace and Redside shiner have naturally hybridized in several locations in southern Yellowstone.

Mountain Sucker

The Mountain sucker (*Catostomus platyrhynchus*) is found in cold, fast, rocky streams and some lakes. It is widely distributed throughout YNP. It can be misidentified with the Longnose dace as they can have similar body forms and size. The back and head are typically dark brown or greenish brown, underside is white, and both males and females have a red/orange strip along the side. Typically grow to a maximum of 6 inches.

Longnose Sucker

The Longnose sucker (*Catostomus catostomus*) is native to the Yellowstone River drainage below the Grand Canyon and was introduced to Yellowstone Lake and its surrounding waters. It is equally at home in warm and cold waters, streams and lakes, and clear and turbid waters. These large, round fish can grow to 22 inches or more and weigh in at over five pounds. They are typically silvery to blueish/gray and develop a reddish band along their side during the spawning season. Concurrent with the decline in cutthroat trout is a steady, long-term decline in the introduced Longnose sucker population within Yellowstone Lake. The mechanism causing this decline is unclear. Longnose suckers are found primarily in shallow water and spawn in tributaries during

the spring. Predation by lake trout during the summer is not significant but it is possible that consumption of suckers by lake trout is higher during winter when water temperatures are extremely cold, allowing lake trout to exploit shallow water habitats where the suckers reside.

Utah Sucker

The Utah sucker (*Catostomus ardens*) is native to the Snake River drainage and can grow to similar size as the Longnose sucker. This species is abundant in Heart River and Heart Lake. Utah suckers have been aged at over 20 years.

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Nonnative Fish Species

Nonnative fish species that were introduced to the park in the late 1800s and early 1900s include Rainbow trout, Brown trout, Brook trout, Lake trout, and Lake chub. Fish species native to Yellowstone have also been transported outside of their native waters. Although nonnative trout are also important to the angler experience in Yellowstone, they have contributed to a decline in the park's native fish species. Nonnative fish distributions and their influence on native fish are not static. While Rainbow trout have not been intentionally stocked since the 1930s, the hybridization of cutthroat trout resulting from Rainbow trout range expansion continues to be the greatest threat to the park's remaining stream dwelling cutthroat trout populations. Additionally, Lake trout were introduced to Yellowstone Lake by unknown means in the mid-1980s and first appeared in angler catches in 1994. The Lake trout population expanded and, over the following decade, caused a rapid decline in the YCT population in Yellowstone Lake. Through the most intense fish control program in the NPS, the YCT numbers are steadily improving in Yellowstone Lake.

Lake Trout

Lake trout (*Salvelinus namaycush*) are native to Canada, Alaska, the Great Lakes, New England, and parts of Montana. Lake trout were intentionally stocked in Lewis and Shoshone lakes in 1890 by the US Fish Commission (a predecessor of today's US Fish & Wildlife Service). Although lake trout need energy-rich prey to continue to grow, they can persist for years with minimal food resources.

The species was first documented in Yellowstone Lake in 1994. Evidence from chemical patterns in lake trout ear bones (otolith) sampled in the late 1990s indicate that the initial stock originated from nearby Lewis Lake sometime in the 1980s. Despite major efforts to remove them by gillnetting, lake trout have had a significant ecological impact on native YCT, which are an important food source for other native animals. Lake trout differ from cutthroat trout as potential prey because they can grow larger, occupy deeper areas of the lake, and spawn in the lake instead of in shallow tributaries. Lake trout also consume foods that have historically fed cutthroat trout in Yellowstone Lake, thereby making cutthroat trout recovery impossible until the lake trout population is suppressed.

Lake trout, Lewis Lake

Many nonnative fish were introduced to Yellowstone waters to increase angling opportunities for visitors.

Description

- Dark gray body with white spots. Numerous spots on head.
- Deeply forked tail.
- Often white on the edge of fins.

Behavior

- Lake trout are voracious and efficient predators.
- Frequently live >25 years and can grow very large. The Wyoming state record weighed 50pounds (23 kg).
- Fall spawners (September/October). A 12-pound female could produce up to 9,000 eggs annually.
- About 30% of a mature lake trout's diet is cutthroat trout. They can consume cutthroat trout up to 55% their own size.

Distribution

- Heart, Lewis, Shoshone, and Yellowstone lakes

Rainbow trout

Rainbow Trout

Rainbow trout (*Oncorhynchus mykiss*) are native to North America in waters that drain to the Pacific Ocean from northern Mexico to Alaska. Of the nonnative fish in Yellowstone, Rainbow trout have the closest geographic origin. As the most adaptable member of the salmonid family, they have been successfully introduced throughout the world. Unfortunately, they readily hybridize with cutthroat trout and produce fertile offspring.

Description

- Silvery body, red lateral band, often white on the edge of lateral fins.
- Numerous black spots on head and back, none on belly.

Behavior

- Mainly spawn between March and July. Select populations (Firehole drainage) spawn in fall.
- Eats aquatic and terrestrial insects, crustaceans, mollusks and earthworms.

Distribution

- Widely distributed due to historic stocking efforts.
- Not present in Yellowstone Lake.
- Not present in the Yellowstone River above the Upper Falls or the Snake River.

Eastern brook trout

Eastern Brook Trout

Eastern brook trout was the first nonnative species introduced in Yellowstone. They were stocked in the (then fishless) Firehole River in 1889. Brook trout are native to the eastern United States from Hudson Bay down to the Carolinas and through the Great Lakes.

Description

- Sides spotted with red, pink, or yellow dots, haloed with blue.
- Light spots on dark skin.
- Back, dorsal, adipose, and tail fins have a marbled (vermiculated) appearance.
- Lower fins have a vivid white stripe on the tip

Behavior

- Spawn in fall between September and December. Have a strong tendency to return to natal streams.
- Food selection similar to other trout, but tend to feed on a wider variety of foods.

Distribution

- Not present in the Gallatin River, Yellowstone Lake, or the Yellowstone River above the Upper Falls.

Cutthroat x Rainbow Trout Hybrids

In waters where rainbow trout have been introduced, there has been a serious degradation of the cutthroat trout population through interbreeding.Presently, hybridized cutthroat trout exist throughout the Bechler, Falls, Gallatin, Gardner, Lamar, and Madison river drainages, and the Yellowstone River below the Upper Falls. Hybrids will have characteristics consistent with both species.

Brown trout

Lake chub

Brown Trout

The Brown trout (*Salmo trutta*) is the only nonnative fish species in Yellowstone that is not native to North America. This European species was introduced to Yellowstone in the later part of the 19th century and was recorded as two different species—the Von Behr and the Loch Leven brown trout. These are now thought to be varieties of the same species, and most of the populations in Yellowstone are indistinguishable. They can be aggressive predators and can grow to large sizes. Brown trout have a higher thermal tolerance then Yellowstone's native salmonids and thrive in the Firehole River. Anglers report that they are notoriously finicky when it comes to striking a fly or lure.

Description

- Dark in color, olive, brown, or yellow.
- Pale halos around black spots.
- Vibrant red or orange spots.

Behavior

- Spawn in fall, migrating to small tributaries of large rivers, upstream in small rivers, or to lake inlets.
- Eat mostly insects, crustaceans, and mollusks but have a reputation for eating larger prey: other fish, crayfish, birds, mice, and frogs.

Distribution

- Widely distributed in Gallatin, Gibbon, Firehole, Madison, Lewis, Snake, Gardner, and Yellowstone rivers.
- Not present upstream of Knowles Falls on the Yellowstone River, Yellowstone Lake or the Bechler or Falls rivers.

Lake Chub

The Lake chub (*Couesius plumbeus*) is native to the Missouri and Yellowstone River drainages in Montana and Wyoming, but not to Yellowstone National Park waters. It was most likely introduced by bait fishermen into Yellowstone Lake, McBride Lake, and Abundance Lake in the Slough Creek drainage.

Description

- Dull gray or bluish-gray.
- Rarely more than 6 inches long.

Behavior

- Inhabits cooler lakes and streams, prefers small creeks to large rivers.
- Spring spawner.
- Competes with small trout for food, but likely provides fodder for trout over 16 inches.

Distribution

- Established but uncommon in Yellowstone Lake. Removed from Lake Abundance in 1969.
- Well-established in the Slough Creek drainage.

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History of Fish Management

About 8,000–10,000 years ago, twelve species of native fish, including Arctic grayling, mountain whitefish, and cutthroat trout, dispersed to this region following glacier melt. These native fish species provided food for both wildlife and human inhabitants. The distribution of native fish species was originally constrained by natural waterfalls and watershed divides. These landscape features provided a natural variation of species distributed across the landscape and vast areas of fishless water. At the time Yellowstone National Park was established in 1872, approximately 40% of its waters were barren of fish—including Lewis Lake, Shoshone Lake, and the Firehole River above Firehole Falls.

Early Fish Management

Created in 1872, Yellowstone National Park was, for several years, the only wildland under active federal management. Early visitors fished and hunted for subsistence, as there were almost no visitor services. At the time, fishes of the park were viewed as resources to be used by sport anglers and provide park visitors with fresh meals. Fish-eating wildlife, such as bears, ospreys, otters, and pelicans, were regarded as a nuisance, and many were destroyed as a result.

To supplement fishing and to counteract "destructive" consumption by wildlife, a fish "planting" program was established in Yellowstone. Early park superintendents noted the vast fishless waters of the park and asked the US Fish Commission to "see that all waters are stocked so that the pleasure seeker can enjoy fine fishing within a few rods of any hotel or camp" (Boutelle 1889). The first fishes from outside the park were planted in 1889–1890 and included brook trout (*Salvelinus fontinalis*) in the upper Firehole River, rainbow trout (*Oncorhynchus mykiss*) in the upper Gibbon River, and brown trout (*Salmo trutta*) and lake trout (*Salvelinus namaycush*) in Lewis and Shoshone lakes. The harvest-oriented fish management program accounted for the planting of more than 310 million native and nonnative fish in Yellowstone between 1881 and 1955. In addition, from 1889 to 1956, some 818 million eggs were stripped from Yellowstone trout and shipped to locations throughout the United States.

Many rows of wooden boxes used to raise trout
Trout-rearing ponds in Mammoth. May 1929
Largely due to these activities and the popularity of Yellowstone's fisheries, recreational angling became

Early Run of blackspotted spawners. May 1936, Pelican Creek, Lanoue.

The newly constructed Yellowstone Lake Fish Hatchery, 1928.

a long-term, accepted activity in national parks throughout the country. In Yellowstone, fisheries management, as the term is understood today, began with the US Army, and was assumed by the National Park Service in 1916. Fish stocking, data gathering, and other monitoring activities began with the US Fish Commission in 1889, were continued by the US Fish and Wildlife Service until 1996, and have been the responsibility of the National Park Service since then.

The stocking of nonnative fishes by park managers has had profound ecological consequences. The more serious of these include displacement of intolerant natives such as westslope cutthroat trout (*O. clarki lewisi*) and Arctic grayling (*Thymallus arcticus*); hybridization of Yellowstone (*O. c. bouvieri*) and westslope cutthroat trout with each other and with nonnative rainbow trout; and, most recently, predation of Yellowstone cutthroat trout by nonnative lake trout. Over the years, management policies of the National Park Service have drastically changed to reflect new ecological insights. Subsistence use and harvest orientation once guided fisheries management. Now, maintenance of natural biotic associations or, where possible, restoration to pre-Euro-American conditions have emerged as primary goals. Eighteen fish species or subspecies are currently known to exist in Yellowstone National Park; 12 of these are considered native (they were known to exist in park waters prior to Euro-American settlement), and five are introduced (nonnative). Today, about 40 lakes have fish; others were either not stocked or have reverted to their original fishless condition.

Yellowstone Lake Fish Hatchery

Hatchery operations at Yellowstone Lake became part of this undertaking when fish hatched from Yellowstone's trout were used to stock waters in the park and elsewhere, sportfishing was promoted to encourage park visitation, and satisfying a recreational interest took precedence over protection of the park's natural ecology. Built in 1930 by the National Park Service, the hatchery's log-framed design is also an example of the period of rustic architectural design in national parks.

The hatchery was thought to be among the most modern in the West. The main room was outfitted with tanks and raceways for eggs, fingerlings, and brood fish taken from 11 streams that flowed into the lake. Small fry were fed in three rectangular rearing ponds in a nearby creek until they were ready for planting. Superintendent Horace Albright explained that the hatchery had also been designed with visitor education in mind, by making it possible "to take large crowds through the building under the guidance of a ranger naturalist without in any way impairing the operations of the Bureau of Fisheries."

Yellowstone was the largest supplier of wild cutthroat trout eggs in the United States, and its waters received native and nonnative fish. A rift developed, however, between the federal fish agencies and the National Park Service, which began moving away from policies that allowed manipulation of Yellowstone's natural conditions. In 1936 Yellowstone managers prohibited the distribution of nonnative fish in waters that did not yet have them and opposed further hatchery constructions in the park's lakes and streams. After research showed that it impaired fish reproduction, egg collection was curtailed in 1953. Four years later, the fish hatchery ceased operations and the US Fish and Wildlife Service transferred ownership of the building to the National Park Service. Official stocking of park waters ended by 1959.

Today, vegetation and stream flow have largely reclaimed the rearing ponds on Hatchery Creek, but their outlines can still be detected, and the most serious results of fish planting are irreversible. Nonnative fish can alter aquatic ecology through interbreeding or competition with native species. Although its condition has deteriorated, the hatchery building has changed relatively little. Nearly all of the exterior and interior materials are original to the building or have been repaired in kind. Now used as a storage facility, it is the primary structure of the nine buildings in the Lake Fish Hatchery Historic District, which was listed on the National Register in 1985.


Rotenone drip station.

Native Fish Restoration Efforts

Yellowstone Cutthroat Trout

While the Yellowstone cutthroat trout is historically a Pacific drainage species, it has naturally traveled across the Continental Divide into the Atlantic drainage. One possible such passage in the Yellowstone area is Two Ocean Pass, south of the park in the Teton Wilderness. Habitat remains pristine within Yellowstone National Park, but nonnative fish species pose a serious threat to native fish. In Yellowstone Lake, lake trout are a major predator of cutthroat trout. In other waters, brown, brook, and rainbow trout all compete with cutthroat trout for food and habitat. Rainbow trout pose the additional threat of hybridizing with cutthroat trout.

Lamar River

Because no barriers to upstream fish migration exist in the mainstem Lamar River, descendants of rainbow trout stocked in the 1930s have spread to many locations across the watershed and hybridized with cutthroat trout. Genetic analysis indicates that cutthroat trout in the headwater reaches of the Lamar River remain genetically unaltered.

To protect the remaining Yellowstone cutthroat trout, the NPS has implemented a selective removal approach. A mandatory kill fishing regulation on all rainbow trout caught upstream of the Lamar River bridge was instituted in 2014. Currently regulations state that all nonnative fish and identifiable cutthroat x rainbow trout hybrids upstream of Knowles Falls must be killed. Selective removal by electrofishing has been conducted annually through the Lamar Valley since 2013. In 2019, 7% of fish sampled during electrofishing surveys upstream of the Lamar River Canyon were classified as rainbow or hybrid trout. This low percentage is a stark contrast to work conducted downstream of the Canyon.

In 2015, 136 fish were sampled downstream of the Lamar River bridge. Based on field identification, 48% were Yellowstone cutthroat trout, 19% were rainbow trout, and 31% were hybrids. The majority of these fish were tagged with radio transmitters or passive integrated transponder (PIT) tags as part of an ongoing research project to determine if Yellowstone cutthroat, rainbow, and hybrid trout are using the same areas to spawn and spawn timing and to inform management actions.

Slough Creek

In Slough Creek, rainbow-cutthroat trout hybrids have been found with increasing frequency over the past decade. Unlike the Lamar River, Slough Creek is smaller, and a barrier to upstream fish movement has been constructed. With a barrier in place and rainbow trout no longer allowed passage into the system, existing rainbow and hybrid trout can be effectively managed with angling and electrofishing removal.

Soda Butte Creek

Brook trout became established in Soda Butte Creek outside of the park boundary and spread downstream into park waters in the early 2000s. Initially, brook trout were isolated in headwater reaches by a chemical barrier created by mine contamination upstream of Cooke City, Montana. When the mine tailings were capped and water quality improved, brook trout passed downstream and began to negatively impact the cutthroat trout.

For nearly two decades, interagency electrofishing surveys were enough to keep brook trout populations

low but did not prevent range expansion. Over time, brook trout spread downstream and became a threat to the Lamar River. In addition, rainbow trout hybridization continued to be identified in cutthroat trout upstream of Ice Box Canyon.

In 2013, Ice Box Falls was modified to be a complete barrier to upstream fish movement, preventing further rainbow trout introgression. Rotenone, a fish toxin, was then used to remove all nonnative fish from the system. Nearly 450 brook trout were removed during the chemical treatment in 2015. Only two brook trout were collected from Soda Butte Creek during a second treatment in 2016. From 2017 through 2021, eDNA sampling as well as electrofishing surveys found no evidence of brook trout in the system. This is a good indication that a complete kill was achieved in the drainage. However, in 2022, following historic flooding in the system, brook trout were discovered.

In 2023, NPS, USFS, and MTFWP fisheries biologists worked to determine the spatial extent of the invasion, develop an action plan, and ultimately chemically treat Soda Butte Creek from the Yellowstone National Park boundary downstream to Ice Box Falls. Prior to chemical treatment, crews electrofished the stream and collected over 1,000 Yellowstone cutthroat trout and moved them to a holding location outside of the treatment area. Chemical treatment took place on August 16, and the stream was clear of chemical on August 17. The salvaged YCT were released back into the waters of Soda Butte Creek. The treatment appears to have been a success as all sentinel fish held in cages through the treated waters died within a few hours of receiving chemical. Continued monitoring of the system via electrofishing and eDNA sampling will take place over the next several years to confirm that all brook trout have been eliminated from Soda Butte Creek.

Elk Creek Complex

There is a natural cascade barrier in Elk Creek just upstream from its confluence with the Yellowstone River. The cascade prevented fish from naturally populating the system, so the Elk, Lost, and Yancey creeks complex of streams (Elk Creek Complex) was fishless when first stocked with cutthroat trout in the early 1920s. In 1942, the streams were stocked with brook trout, eventually resulting in the complete loss of cutthroat trout.

To restore YCT to the system, the Elk Creek Complex was treated with rotenone annually from 2012 to 2014 to remove the brook trout population. Once clear of brook trout, reintroduction of native Yellowstone cutthroat trout began. Antelope and Pebble creeks provided fish for restocking in October 2015. Additional stocking took place in 2016 and 2017. Natural reproduction was also documented in 2017 during electrofishing surveys. Semi-annual surveys of the Elk Creek Complex show that YCT are well established in the system and continue to naturally reproduce. No brook trout have been detected since the 2014 rotenone treatment

Arctic Grayling

One of the goals of the park's 2010 Native Fish Conservation Plan is to restore fluvial grayling to approximately 20% of their historical distribution. The upper reaches of Grayling Creek are considered the best site for immediate fluvial grayling restoration. Near the park boundary, a small waterfall exists in the creek (which flowed directly into the Madison River prior to the construction of Hebgen Dam in 1914).

The Grayling Creek restoration project aims to establish Arctic grayling and westslope cutthroat trout to 95 kilometers (59 miles) of connected stream habitat in one of the most remote drainages in the species historic range within Yellowstone.

During summer 2013, the waterfall was modified to prevent upstream movement of fish into the system. During August 2013, a crew of 27 biologists from Yellowstone National Park, Montana Fish, Wildlife and Parks, Gallatin National Forest, Turner Enterprises, and US Fish and Wildlife Service treated the stream segment with piscicide to remove all fish. A second treatment took place in 2014. Restocking the Grayling Creek watershed with native fluvial Arctic grayling and WCT began in 2015 and continued through 2017. The effort included moving approximately 950 juvenile and adult WCT to the lower reaches of Grayling Creek, above the project barrier. In addition, 54,200 WCT eggs and 210,000 fluvial grayling eggs were placed in remote-site incubators throughout the upper watershed. In 2018, park biologists and Montana State University researchers began to evaluate the success of reintroduction efforts on upper Grayling Creek. Preliminary results suggest that WCT are slowly repopulating the system, but grayling are struggling to establish a self-sustaining population.

From 2017–2021, park managers worked on a native fish restoration project in the upper Gibbon River drainage including Grebe, Wolf, and Ice lakes, and the Gibbon River upstream of Virginia Cascades. After removing nonnative species, biologists stocked more than 100,000 westslope cutthroat trout embryos and fish, and 170,000 Arctic grayling fry. An additional 7,000 grayling fry were stocked in Grebe Lake in 2023.

Angling has been highly successful for both species post-stocking, and natural reproduction was first documented for westslope cutthroat trout in 2022 and for Arctic grayling in 2023. Downstream dispersal of both species indicates the upper Gibbon River may serve as a fish source for the lower Gibbon and Madison rivers. Sites were established in 2023 to monitor native fish recovery and fish captured by electrofishing and angling were equipped with orange Floy tags to estimate abundance, survival, and movement patterns. Anglers who recapture tagged fish in Yellowstone are encouraged to report tag numbers and locations to assist with monitoring efforts.

Westslope Cutthroat Trout

Native species restoration depends on secure brood sources. A brood should be accessible, safe from contamination, self-sustaining, genetically diverse, abundant, of traceable origin, and pose no risk to existing wild populations.

In the park, genetically pure WCT only persisted in one tributary in the Madison River drainage (now called Last Chance Creek) and in the Oxbow/Geode Creek complex where they were introduced in the 1920s. In 2006, Yellowstone began efforts to restore WCT in East Fork Specimen Creek and introduce them into High Lake by constructing a fish barrier, removing nonnative fish, and stocking genetically pure WCT. In 2016 and 2018, surveys conducted throughout East Fork Specimen Creek indicated a naturally reproducing population of WCT, with all fish appearing healthy. Unfortunately research in 2019 revealed that hybridized fish have moved upstream of the constructed barrier, threatening the restored portion of the creek. The long-term goal for this watershed is to integrate East Fork Specimen Creek into a larger WCT restoration project that includes the North Fork to improve the resilience of this isolated population to natural threats. In 2021, the lower reaches of the East Fork Specimen Creek were chemically treated to remove all hybridized fish from this section of stream.

A range expansion project was conducted in Goose Lake and two other small, historically fishless lakes in the Firehole drainage. Nonnative fish removal was conducted in 2011 and staff stocked fry from 2013 to 2015. The long-term project goal is to one day use this pure WCT population as a brood source, providing offspring for restoration projects elsewhere within the upper Missouri River system. While WCT have been found in Goose Lake in low numbers, stocking efforts in the other two lakes have proven unsuccessful.

Another range expansion project is the upper Gibbon River. In 2017, native fish restoration began on the upper portion of Gibbon River, above Virginia Cascades. This project encompasses more than 21 stream miles and 232 lake acres (Wolf, Grebe, and Ice lakes). Since fall of 2017, park biologists have introduced approximately 75,000 WCT and 170,000 Arctic grayling to Wolf, Grebe, and Ice lakes and surrounding tributaries. Fish removal continued on the upper Gibbon River from 2018 through 2020 between Virginia Cascades and Wolf Lake. Removal of nonnative fish in this section was completed in 2020. Future restoration projects for WCT and Arctic grayling are proposed for North Fork Specimen and Cougar creeks. Once completed, native fish will be restored to an additional 61 km of stream waters.

Gillnetting Lake Trout

In 1995, after confirming lake trout were successfully reproducing in Yellowstone Lake, the NPS convened a panel of expert scientists to determine the likely extent of the problem, recommend actions, and identify research needs. The panel recommended that the

Since 2009, the park has contracted a commercial fishing company to increase the catch of lake trout.

park suppress lake trout to protect and restore native cutthroat trout. The panel also indicated that direct removal efforts such as gillnetting or trapnetting would be most effective but would require a long-term, possibly perpetual, commitment.

As initial gillnetting efforts expanded, the number of lake trout removed from the population also increased. This suggested the lake trout population was continuing to grow. In 2008 and 2011, scientific panels were convened to re-evaluate the program and goals. The panel concluded netting is still the most viable option for suppressing lake trout. Both reviews also indicated a considerable increase in suppression effort would be needed over many years to collapse the lake trout population.

Starting in 2009, the park contracted a commercial fishing company, to increase the take of lake trout through gillnetting. From 2011 to 2013, they also used large, live-entrapment nets that allow removal of large lake trout from shallow water while returning cutthroat trout to the lake with little mortality.

Discovery of New Species in Yellowstone Lake

On August 22, 2019, a gill net set in 158 feet of water northeast of Stevenson Island captured one fish of a new species not previously known to exist in Yellowstone Lake. This was a 3-year-old immature female cisco (*Coregonus artedi*). Based on otolith microchemistry, it likely hatched in Yellowstone Lake. Undoubtedly this species was illegally introduced to Yellowstone Lake, as the nearest source populations are in northern Montana and Minnesota. There are no existing waterways between Yellowstone Lake and any known cisco populations. In its native range, cisco are a preferred prey item for lake trout where the two species overlap. They prey mostly on aquatic invertebrates and tend to reside at mid-water depths. Fortunately, despite miles of gill nets, some specifically targeting cisco habitat, surface tows for larvae, eDNA sampling at 24 sites around the lake, and examination of thousands of lake trout stomachs, no other cisco have been found in Yellowstone Lake.

Fish Management Research

In 2010, Yellowstone developed the Native Fish Conservation Plan. This adaptive management plan guides efforts to recover native fish and restore natural ecosystem functions based on scientific assessment.

In 2011, the National Park Service and the US Geological Survey launched a movement study to target lake trout embryos in spawning beds and identify general and seasonal movement patterns. The results helped gillnet operators to target lake trout more efficiently.

In 2013, NPS and Montana State University conducted a mark-recapture study of lake trout in Yellowstone Lake. To estimate population size, 2,400 lake trout were tagged and released back into the lake. More than 5% of tagged fish were recaptured within the same fishing season. Results produced an estimate of the number of lake trout present in the lake: 367,650 fish greater than 210 millimeters (8.3 in.) long.

The mark-recapture study also helped estimate rates of capture for four size classes. This effort removed 72% of lake trout 210–451 millimeters (8.3–17.8 in.) in length, 56% for fish 451–541 millimeters (17.8–21.3 in.) long, 48% for fish 541–610 millimeters (21.3–24.0 in.) long, and 45% for fish more than 610 millimeters (>24.0 in.) long. These results supported previous estimates and highlighted the difficultly in catching older, mature lake trout, which eat the most native cutthroat trout and have the highest reproductive success. In 2022, we caught three lake trout which had originally been tagged in 2013 as part of this study.

More Information

100th Meridian Initiative: www.100thmeridian.org

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Hammerhead crew member holds a large lake trout from Yellowstone Lake.

Fish Management

As early as 1889, soon after the park was established in 1872, park managers started planting native fish in fishless waters and bringing nonnative species into the park. In the mid-1930s, the park stocking policy changed to exclude the stocking of nonnative fish species and selected waters were left "barren of fish." In the 1950s, the large-scale stocking of native species for recreational purposes was stopped in favor of wild fish management and native species conservation. However, by then over 300 million fish had been stocked in park waters and, nonnative species were firmly established in many lakes, rivers, and streams. To this day, nonnative fish are the biggest threat to the persistence of native fish in Yellowstone National Park and its surrounding waters.

An example of the significant negative consequences nonnative fish can have on an ecosystem is highlighted by the take-over of non-native lake trout in Yellowstone Lake. In 1994, lake trout were discovered in Yellowstone Lake. Soon after, park biologists confirmed that lake trout, a voracious predatory fish, were reproducing and proliferating at a rapid rate in Yellowstone Lake. It was also confirmed that larger lake trout were feeding heavily on native Yellowstone cutthroat trout, decimating the population of this native species in the lake. An expert panel suggested gillnetting would be the most effective method to remove lake trout to protect native Yellowstone cutthroat trout, although it would a require a long-term, possibly perpetual, commitment. The National Park Service agreed, and the lake trout control program was started.

Our Goals

- **We reduce the long-term extinction risk for Arctic grayling, westslope cutthroat trout, and Yellowstone cutthroat trout.** Nonnative brown, brook, and rainbow trout all compete with native species for food and habitat. Rainbow trout pose the additional threat of hybridizing with cutthroat trout. Lake trout are a primary predator of young fish, including Yellowstone cutthroat trout, in Yellowstone Lake.
- **We restore and maintain the important ecological role of native fishes.** Bald eagles, ospreys, pelicans, otters, grizzly bears, and other wildlife eat native fishes. Nonnative lake trout live and spawn in waters too deep for most of Yellowstone's predators.
- **We create sustainable native fish angling and viewing opportunities, delivering a world-class visitor experience.** Yellowstone Lake and the Yellowstone River together are home to the world's largest inland population of Yellowstone cutthroat trout. They're the most prized and highly regarded by visiting anglers.

Native Fish Conservation Plan

To reverse the decline in native fish populations in Yellowstone and restore ecosystem integrity, the National Park Service is implementing targeted actions to promote native fish recovery. The actions aim to conserve native fish species from threats of nonnative species, disease, and the impacts of climate change. Guided by scientific peer review and informed by an environmental assessment completed in 2010, the Native Fish Conservation Plan uses the best available methods to address threats to Yellowstone's native fisheries. The plan focuses on direct intervention and welcomes the assistance of visiting anglers.

Efforts in Yellowstone Lake Ecosystem

Since 1994, over 5.1 million lake trout have been removed from Yellowstone Lake. Gillnet operations provide important data about lake trout population, age, maturity, and potential spawning areas, which help control them more effectively. Accidental catching of native trout is minimized by fishing in deeper waters not typically used by Yellowstone cutthroat trout.

In partnership with Montana Fish, Wildlife & Parks, Yellowstone resumed the Soda Butte Creek Native Fish Restoration Project to remove newly discovered, nonnative brook trout.

The Future of Lake Trout Control

Although complete elimination of lake trout in Yellowstone Lake is not possible with today's tools, ongoing efforts can significantly decrease their numbers. Continued strong suppression efforts will reduce lake trout to a level where they have only minor impacts on Yellowstone cutthroat trout. Since lake trout can reproduce rapidly, their numbers are likely to rebound quickly without sustained suppression efforts.

Currently, gillnetting is the main method used to decrease lake trout numbers. Alongside partners at the US Geological Survey (USGS) Montana Cooperative Fishery Research Unit and Montana State University, methods to destroy lake trout eggs at their spawning sites are being explored. Several techniques have been tested, with spreading plant-based pellets over spawning sites to suffocate the eggs being the most promising. Early research suggests these pellets are easier to manage than other substances and effectively kill the embryos. While this method alone may not reduce overall lake trout numbers, it could be crucial for keeping their population down once control targets are reached and gillnetting can be reduced.

Efforts in Other Park Streams, Rivers, and Lakes

Competition, predation, and hybridization are the primary challenges posed by nonnative fish in other park streams, rivers, and lakes. Other concerns include habitat changes, diseases, and the impacts of climate change. Work involves isolating the project area, removing nonnative fish, and reintroducing genetically pure native species.

Using this method nearly 200,000 westslope cutthroat trout and 760,000 Arctic grayling have been introduced to 67.2 stream miles and 281 lake acres in the Gallatin and Madison watersheds since 2007.

Isolating a Project Area

Headwater refuges are important for native inland fish survival because in many instances, they offer isolation from nonnative fish. To create refuges where they don't exist, natural waterfalls are enhanced or artificial barriers are constructed to block fish from moving upstream.

Removing Nonnative Fish

Fish toxins (piscicides), like rotenone, are often used to control nonnative fish. Rotenone is toxic to gill-breathing organisms but relatively safe for humans and wildlife. To minimize the impacts to other aquatic life, park biologists conduct surveys to ensure the lowest effective concentration is used, time chemical use after amphibian metamorphosis, and neutralize the chemical at the end of the desired treatment area. Native fish are also temporarily removed using electrofishing and reintroduced once the water is safe.

Reintroducing Native Fish

Remote site incubators and live fish stocking are the two methods used for native fish reintroduction, each with advantages and limitations. To ensure long-term sustainability, park biologists monitor progress at project sites through population surveys. Different age classes of fish are collected to evaluate population health and confirm natural reproduction in years following stocking.

Remote Site Incubators

Gametes are obtained from native fish populations within and outside of the park. After fertilization, eggs are raised in hatcheries outside the park. Once reaching the eyed (near hatching) stage, the embryos are moved to remote site incubators (RSIs) in the park, where they will hatch and swim into the stream system. RSIs allow the fish to imprint to these streams, encouraging them to return as spawning adults. RSIs also make it possible to stock large numbers of fish with minimal effort.

Stocking

Stocking live fish involves transporting young fish (fry), juveniles, or adults from a hatchery or wild population to the project area. This method is low maintenance, swiftly restores recreational fishing, and is less susceptible to disturbances. However, it can be expensive in remote areas when helicopters are needed to transport fish. Additionally, stocked fish


Many people come to Yellowstone to fish.

may have lower survival and reproductive levels since they weren't imprinted within the project area waters.

Sport Fishing

Yellowstone supports some of the world's most famous fisheries and has been a destination for generations of anglers for over 150 years. Fishing regulations are designed to maintain native fish abundance and genetic integrity, the park's overall ecological integrity, and a recreational fishery for park visitors.

Examples of recent regulation changes include a "must kill" for lake trout and other nonnatives when caught in areas where they are harming native fish, "drought fishing" closures during periods of heat stress, and a ban on felt-soled wading boots to prevent introduction of harmful aquatic invasive species.

The Yellowstone Fly Fishing Volunteer Program

There are an estimated 2,650 miles of streams and 150 lakes with surface waters covering 5% of Yellowstone's 2.2 million total acres. The Yellowstone Fly Fishing Volunteer Program engages in "fly fishing for science" to aid fisheries biologists in their efforts to identify, maintain, enhance, and restore native fish populations throughout the park. Established in 2002, this approach allows Yellowstone's biologists to acquire data without having to travel to distant locations with electrofishing or other sophisticated gear.

FRENQUENTLY ASKED QUESTIONS

How many Lake trout were removed from Yellowstone Lake in 2025?

In 2025, the National Park Service and commercial crews removed a total of 289,900 lake trout. Catch rates were up in the small and large meshes, giving 2025 the highest catch rates we've seen in large meshes since 2015. Efforts will continue to focus on all sizes of lake trout while concentratingon these larger fish, aiming to reduce their numbers before they spawn.

How much support has Yellowstone Forever Provided to the Native Fish Conservation Program?

Since 2018, Yellowstone Forever—Yellowstone's official nonprofit partner—has provided around $1.3 million to the program each year.

Why don't Yellowstone predators eat lake trout?

Lake trout differ from cutthroat trout as potential prey because they are generally not available: they can grow larger, occupy deeper areas of the lake, and spawn in the lake instead of in shallow tributaries.

How did lake trout get into Yellowstone Lake?

Lake trout were introduced to Yellowstone Lake by unknown means in the mid-1980s and first appeared in angler catches in 1994. Otolith microchemistry and genetics research suggest they came from Lewis Lake.

How do you locate lake trout spawning sites in Yellowstone Lake?

We use a combination of likely habitat, relocations of lake trout equipped with acoustic transmitters, and gillnetting results.

How many miles of gillnet are deployed each year?

In recent years, miles of gillnet ranged from 5,000 to 6,000 miles per year.

What is a Judas fish?

A "Judas" fish is one who betrays his friends by leading others to them. In our case, it's a lake trout equipped with an acoustic transmitter who can help us find where concentrations of lake trout may be spawning.

How many people volunteered or the Fly Fishing Program in 2023?

In 2023, 53 volunteers spent 1,173 hours capturing, tagging, and recording Yellowstone cutthroat trout, rainbow and hybrid trout, in Slough Creek and Lamar River. Nonnative rainbow and hybrid trout were removed to support native fish recovery and assess angling as a method for long-term population monitoring. Volunteers also gathered data on the grayling population in Ice Lake and the upper Gibbon River watershed.

The lake trout, introduced to Yellowstone Lake, is one of several aquatic nonnative species having a significant detrimental effect on the park's aquatic ecology.

Aquatic Invasive Species

During the late 1880s when the Army administered Yellowstone, the US Fish Commission (a predecessor of today's US Fish and Wildlife Service) stocked nonnative fish in some park waters. These stockings are the first known, deliberate introductions of nonnative fish to Yellowstone.

Other aquatic invasive species (AIS), such as the New Zealand mud snail and the parasite causing whirling disease have arrived since. We may never know exactly how those species were introduced to the park, but it's likely they were carried here from other parts of the country by unwitting anglers.

New Zealand Mud Snails

The New Zealand mud snail (*Potamopyrgus antipodarum*) is an invasive species that was first found in the western United States in the 1980s. Their habitat includes flowing water and some geothermal streams. The snails can form dense colonies on aquatic vegetation and streambed rocks. This crowds out invertebrates that are a primary food for immature trout and other native species. New Zealand mud snails consume large amounts of algae, which is a primary food for native aquatic invertebrates. Its impact on algae is likely to affect entire stream food webs. With its protective shell, the mud snail provides little if any nutrition to its predators. It may pass through a fish alive. Scarcely a quarter-inch long, mud snails may cling to boats, trailers, waders, and other fishing gear. This gear can inadvertently transfer the snails to another waterbody. Because the species can reproduce asexually, a single mud snail is all that is required to establish a new colony.

Population

First detected in the park in 1994, New Zealand mud snails are now in all major watersheds. Although they are abundant in several streams, they are absent or uncommon in others. This suggests that the mud snail's upstream density and distribution is limited by spring runoff. Spring runoff can cause colder temperatures, low productivity, and unstable streambeds.

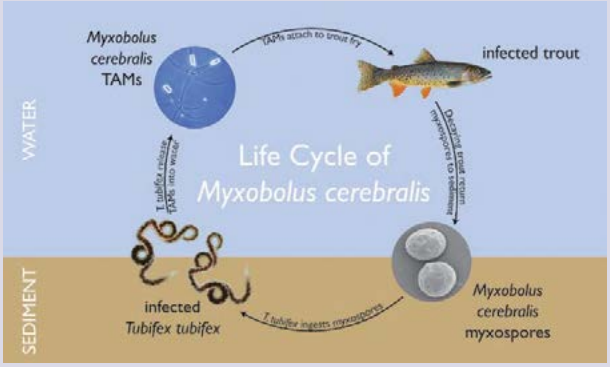
New Zealand mud snails shells resting on a dime.

Impacts of Mud Snails

Once mud snail colonies become established in a stream, removing them without disrupting native invertebrates is not possible. Mud snail research aims to determine the species' impacts on the aquatic ecosystem. A study of the Gibbon and Madison rivers found that 25–50% of the macroinvertebrates were mud snails. The areas they occupied had fewer native mayflies, stoneflies, and caddisflies. These insects are important in the diet of native fish and several bird species.

Whirling Disease

Whirling disease is caused by a microscopic parasite from Europe (*Myxobolus cerebralis*) that can infect some trout and salmon. It does not infect humans. Twenty-five states have detected whirling disease. During the parasite's life cycle, it takes on two different forms. Each form needs its own host. The triactinomyxon (TAM) form, develops in common aquatic worms (*Tubifex tubifex*) and is released into the water column. Once released they float with the current and can come into contact and attach to trout. Cutthroat trout are susceptible, especially during the



Whirling Disease

Description

- Caused by a microscopic parasite.
- Infected fish may have skeletal deformities and a blackened tail.
- Infected fish may have a whirling swimming behavior.

Habitat

- Early stage of the parasite's life cycle requires a widespread aquatic worm as a host.
- The second stage of life infects cutthroat trout.
- Young cutthroat trout are especially vulnerable.

Distribution

- Has been found in the Firehole, Madison, Gibbon, Lamar rivers and the Yellowstone Lake drainage.

first months of life. The parasite feeds on the trout's cartilage and develops into the myxospore form of the parasite. This can cause skeletal deformities, a blackened tail, and whirling swimming behavior. Because infected trout can't feed normally, and are more vulnerable to predation, whirling disease can be fatal. No practical treatment exists for trout infected with this disease or for the waters containing infected trout or tubificid worms.

Presence and Impact in Yellowstone

Whirling disease was first detected in Yellowstone in 1998 in cutthroat trout from Yellowstone Lake. The disease was described in Europe more than 100 years ago. It was detected in the United States in the mid-1950s before making its way to Yellowstone. It most likely came to the US in frozen fish products. In Yellowstone it has been found in the Firehole, Madison, Gibbon, Gallatin, and Lamar rivers and the Yellowstone Lake watershed. In the lake, the infection has spread to about 20% of cutthroat trout. The parasite is most prevalent in Pelican Creek and the Yellowstone River downstream of the lake. Infection has been most severe in Pelican Creek. This stream once supported nearly 30,000 upstream-migrating cutthroat trout. Whirling disease and nonnative lake trout that eat cutthroat trout in Yellowstone Lake are likely causes of this decline. Some adult cutthroat trout in Yellowstone Lake have survived their initial infection. This suggests some resilience to whirling disease among cutthroat trout.

Studying the Disease

Yellowstone's cutthroat trout spawning streams vary widely in thermal, hydrological, and geological characteristics. This provides an exceptional opportunity to study whirling disease in native trout. Park staff have been working with Montana State University's Department of Ecology to measure how the infection rate might vary in different stream conditions. Recent laboratory tests suggest cutthroat trout are highly susceptible to whirling disease. Lake trout and grayling appear immune to the disease. Brown trout are resistant to whirling disease but can carry the parasite to other species. Certain fish-eating birds have also been shown to disperse the parasite. Research has found that the parasite can pass alive through the digestive tract of some birds, such as great blue herons. Recent surveys showed that whirling disease risk was still very high in Pelican Creek. But it does not appear that whirling disease has spread widely throughout spawning tributaries to Yellowstone Lake. Also, prevalence of infection in young and adult cutthroat within the lake remains low. Despite this, there are still many unknowns about how the parasite functions in Yellowstone's unique environment.Park staff focus on prevention through education. Visitors who fish, boat, or swim are asked to take steps to help stop the spread of the disease. Thoroughly cleaning mud and aquatic vegetation from all equipment and footwear before moving to another drainage is the best prevention. Anglers should not transport fish or water between drainages. Fish should be cleaned in the body of water where they were caught.

Red-rimmed Melania

Red-rimmed melania (*Melanoides tuberculatus*), a small snail imported by the aquarium trade starting in the 1930s, were discovered in 2009 at the confluence of the Boiling River, a thermal spring, and the

Gardner River. Live snails were found downstream for approximately one kilometer. The following year, a survey of 18 similar thermal areas in the park found no additional melania. The species has a narrow temperature tolerance (18–32°C) and is unlikely to survive downstream of the Boiling River during the winter, but it could become established in other thermal water in the park.

The red-rimmed melania is a small snail imported by the aquarium trade beginning in the 1930s.

Aquatic Invasive Species of Concern

Many AIS species of concern are not yet present in Yellowstone, but they pose a grave and growing threat to the park and the Greater Yellowstone Ecosystem as they continue to spread into the surrounding states.

Further invasion of park waters by AIS could mean devastating effects on the Yellowstone's thriving and diverse aquatic ecosystem and detrimental impacts to recreational opportunities, waterways, and communities downstream. Yellowstone straddles the Continental Divide and headwaters that flow from the park drain to the Pacific and Atlantic oceans.

Zebra mussels removed during an inspection from a boat that was attempting to launch in Yellowstone waters.

Dreissenid Mussels

Both zebra mussels (*Dreissena polymorpha*) and closely related quagga mussels (*Dreissena bugensis*), are collectively called dreissenids. They are of particular concern because they can be spread easily and cause great harm. The mussels can attach to watercraft and survive many days out of water. Boaters must follow Clean, Drain, Dry to avoid unknowingly spreading them (more at **www.nps.gov/yell/learn/management/ais.htm**).

Zebra mussels are native to Eastern Europe and western Asia. They were first discovered in North America in 1988 in Lake St. Clair, one of the water bodies connecting the Great Lakes. It is believed they were introduced through ballast water discharges from international shipping.

Following their invasion, zebra mussels spread quickly across most of the eastern United States and Canada. Traveling boaters inadvertently spread the mussels from one body of water to another.

Zebra mussels drastically alter the ecology of infested water bodies. The effect on the ecosystem can be severe. These efficient filter-feeders consume significant amounts of phytoplankton. This depletes the foundation of the aquatic food web. Zebra mussels can attach to most hard surfaces, forming mats that may be up to 18 inches thick. Mussels can impact recreational activities and associated economies. They cover docks, boats, and beaches. Zebra mussels can also completely block water intake pipes. Blockages can severely damage power plants, water treatment plants, irrigation systems, and industrial facilities. Birds and fish that prey upon zebra mussels in Europe are not found in North America.

Smallmouth Bass

Smallmouth bass are an evolutionarily-advanced, prolific, and highly predatory fish species. They have caused severe losses of native fish populations in other North American locations where they have been introduced. Smallmouth bass will also prey upon many other native species, including macroinvertebrates, amphibians, reptiles, small mammals, and young waterbirds.

Warming river temperatures may have made the upstream movement of smallmouth bass easier in recent years. This could contribute to the species now being present at Yellowstone National Park's northern boundary. Climate-caused changes to river flows and temperatures may continue making it easier for smallmouth bass to move and live upriver. Of


USFWS

Zebra mussel colony.

particular concern is the ability of smallmouth bass to pass over natural cascades or waterfalls that often stop other fish species. If smallmouth bass move over the Knowles Falls of the Yellowstone River, they will eventually invade the Yellowstone River near Canyon Village. This would also allow them to enter the Lamar River watershed. Both are important habitats for native Yellowstone cutthroat trout. They are also some of the largest remaining strongholds for native Yellowstone cutthroat trout throughout their entire historical range in Montana, Idaho, and Wyoming.

Management may take actions to reduce further upstream invasion of smallmouth bass in Yellowstone National Park. Possible actions include education of park staff, outfitters, and anglers; incorporation of this new invasive species in the park angling regulations booklet; and/or population suppression by NPS biologists using electrofishing or other capture techniques. Any smallmouth bass caught by an angler in Yellowstone must be killed and reported.

Asian Carp

The bighead carp (*Hypophthalmichthys nobilis*), black carp (*Mylopharyngodon piceus*), and silver carp (*Hypophthalmichthys molitrix*) occur in at least 24 states. All three are types of Asian carp. They outcompete native fish, reduce forage for other fish, and can transmit disease. Silver carp can also jump great distances out of the water when boats travel near them. This can injure boaters.

Silver carp are native to Southeast Asia and east Russia. They were intentionally introduced into the United States in 1973 as an attempt to improve water quality, increase fish production in culture ponds, as biological control, and as a food fish. Silver carp now occur in at least 24 states and reproduce naturally. Both the silver and the bighead carp compete for food (zooplankton) with native fish.

Black carp are native to Asia and eastern Russia. These fish were unintentionally introduced as a stowaway with intentionally introduced grass carp. Black carp now occur in at least nine states. Black carp may reduce populations of native mussels and snails through predation. Fewer native mussels and snails harms the aquatic ecosystem. None of these species are currently found in Wyoming, or Montana.

These invasive species may continue to be spread intentionally or by accident. Accidental introductions happen through improperly using or disposing of live fish or fish eggs used as bait. Asian carp can also move to new areas through connected waterways.

Asian Clam

Asian clam (*Corbicula fluminea*) was introduced to the United States in 1938. It has spread into many of the major waterways of 46 states. The species have not been completely distinguished, but most varieties are small and yellow-green to light brown in color.

The native ranges are in temperate to tropical southern Asia west to the eastern Mediterranean; Africa, except in the Sahara Desert; and southeast Asian islands south into central and eastern Australia. The Asian clam is a filter feeder that removes particles from the water column. It is found at the sediment surface or slightly buried. The Asian clam can reproduce rapidly and has a low tolerance of cold temperatures (36–86°F/2-30°C). This can cause wild swings in population from year to year in northern water bodies.

Eurasian Watermilfoil

Eurasian watermilfoil (*Myriophyllum spicatum*) has spread to all the United States except Hawaii and Wyoming. In 2007, it was found in Montana.

This nonnative aquatic plant lives in calm waters such as lakes, ponds, and slow-moving parts of streams. It grows well in water with disturbances, sewage spills or abundant motorboat use, like Bridge Bay.

Eurasian watermilfoil is spread by stem fragments moved from one waterbody to another. Boats, gear, and trailers can all carry the stem fragments. Cleaning, rinsing, and inspecting these items before they enter Yellowstone can stop this spread.

Phytoplankton

Three nonnative plankton species that could harm Yellowstone may be on their way. These species can displace native zooplankton that are important food for cutthroat trout. The three nonnative zooplankton have long spines. The spines make them difficult for young fish to eat.

AIS Management

Aquatic invasive species (AIS) pose a grave and growing threat to the Greater Yellowstone Ecosystem. An AIS is a freshwater or marine organism that has spread or been introduced beyond its native range and is either causing harm or has the potential to cause harm. AIS can quickly and drastically transform habitats and food chains, causing permanent declines in fish and food resources for native wildlife. At least eight AIS already exist in Yellowstone's waters: New Zealand mud snail, red-rimmed melania, five nonnative fish, and whirling disease.

Our Goals

- **We promote aquatic invasive species awareness and communicate how to stop them.** Using Clean, Drain, Dry procedures is an effective way to stop the spread of AIS. Some invasive species, such as mussels, can survive as long as 30 days out of water (more at **www.nps.gov/yell/learn/management/ais.htm)**.
- **We work with partners to inspect incoming watercraft for aquatic invasive species.** Yellowstone National Park, Grand Teton National Park, and surrounding states aim to inspect all boats entering the region before launch to maximize protection of park and surrounding waters and minimize inconvenience to visitors.
- **We monitor Yellowstone waters for aquatic invasive species.** Early detection of AIS, including the use of environmental DNA surveys, can prevent the accidental spread to other areas.

Preventing Aquatic Invasive Species

Prevention is the best tool in AIS management. Once an AIS is established in an area, it's usually impossible to eradicate, or the eradication methods come with serious environmental consequences. Also, controlling an established population is difficult and expensive. Yellowstone works to prevent new AIS from entering the park through public education and awareness, a permit and inspection process, and aquatic resource monitoring.

To prevent the introduction of more aquatic nuisance species, park staff inspect all watercraft prior to launching in the water.

Education & Awareness

The Stop Aquatic Hitchhikers! national education campaign was launched by the Aquatic Nuisance Species Task Force in 2002. The goals of the campaign are to raise awareness, change behaviors, and build community capacity to stop the spread of aquatic invasive species across the United States and beyond. Currently, there is a network of over 1,400 campaign partners across the country.

As a proud campaign partner, Yellowstone empowers recreational users of aquatic resources to "Clean, Drain and Dry all watercraft, trailer, motors, and gear every time, everywhere."

Permits & Inspections

Yellowstone employs a team dedicated to inspecting all watercraft before launch. In combination with the efforts of responsible visitors who clean, drain, and dry their watercraft before arriving in Yellowstone, these inspectors provide a vital line of defense against aquatic invasive species. All watercraft, including angler float tubes and paddle boards, must pass a Yellowstone AIS inspection to receive a permit prior to launching.

Monitoring & Early Detection

Yellowstone biologists monitor the distribution of known AIS populations and screen for new populations or introductions. Monitoring efforts are

Incoming Threats

The greatest threat to Yellowstone's aquatic resources is from zebra and quagga mussels. Yellowstone, Wyoming, and Montana are currently mussel-free. To reduce the risk of spreading AIS, Wyoming and Montana have increased staff and inspection stations. Biologists from Yellowstone, Wyoming, and Montana will continue to monitor aquatic resources and may implement additional preventative measures.

If nonnative mussels are detected in the Greater Yellowstone Ecosystem or surrounding area, park managers will consider a temporary closure of all park waters to all watercraft.

If nonnative mussel larvae or adults are found in Yellowstone, all park waters would close to all watercraft (except authorized boats) to prevent the spread to other waterways. The park is currently developing an AIS rapid response plan.

Recent AIS Developments

- In 2024 zebra mussels were detected for the first time in the upper Colorado River system in the state of Colorado.
- In 2024 highly invasive golden mussels were discovered in California, the first detection of the species in North America. They tend to have similar impacts as quagga/zebra mussels where they establish outside of their native range.
- In 2023, invasive quagga mussels were found in the Snake River near Twin Falls, Idaho. In response, the state of Wyoming designated the entire reach of the Snake River from American Falls Reservoir downstream to CJ Strike Reservoir as a high-risk waterbody. As a result, a motor flush is now required for any motorized watercraft launched within this stretch of water in the last 30 days (a protocol that Yellowstone also adheres to).
- In 2023 a treatment was made of the mid Snake River in ID to eradicate quagga mussel populations. It was not successful. Another treatment was carried out in fall 2024, but it will not be known if it was successful until late 2025.
- In 2022 and 2023, adult zebra mussels were confirmed in new areas in South Dakota. One area was Pactola Reservoir in the Black Hills. The reservoir provides water for Rapid City, South Dakota, 13 miles to the east. This rules out draining the reservoir to control the mussels. The mussels are now just 27 miles from the Wyoming border. This prompted the state of Wyoming to close two nearby waterbodies to boating. Both Pactola Reservoir in South Dakota and the Snake River at Twin Falls, Idaho, are within a day's drive of Yellowstone.

focused on quagga and zebra mussels in waters open to boating or with high recreational use. Early detection of AIS is key to limiting the spread and preventing introduction into additional waterways. Park researchers utilize several techniques to monitor for AIS, including environmental DNA sampling, plankton sampling for veligers (the microscopic juvenile stage of mussels), and visual surveys for invasive plants and invertebrates.

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Staff Reviewers

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Amphibians are valuable indicators of environmental stressors such as disease or climate change. Researchers monitor amphibian populations in the park.

Amphibians

Amphibians are an important part of Yellowstone's aquatic and terrestrial ecosystems. Many of Yellowstone's reptiles, birds, mammals, and fish prey on larval and adult amphibians, and amphibians, in turn, eat a variety of vertebrate and invertebrate species. Amphibians are also sensitive to disease, pollution, drought, variations in annual snowpack, and the arrival of nonnative species; these documented sensitivities make them valuable indicators of environmental change. Amphibians often congregate in large numbers for breeding or overwintering. As a result, they can be adversely affected by localized disturbance or the loss of individual breeding or overwintering sites. Amphibian populations that are affected by one or more of these stresses may exhibit changes in their distribution or abundance. These changes can, in turn, have cascading effects on other aspects of the ecosystem.

Declines in amphibian populations are occurring globally in areas where habitat destruction is pervasive, but also in protected areas. About one-third of all amphibian species are believed to be threatened with extinction. Yellowstone includes some of the most climatologically and topographically complex landscapes in the lower 48 states and therefore provides a valuable study area to examine how climate may influence amphibian distribution and trends. Information about the status and trends of amphibians here may shed light on declines documented in other high-elevation locations or other protected areas around the West.

Population

Annual surveys since the early 2000s have documented four amphibian species as widely distributed in Yellowstone: boreal chorus frogs, Columbia spotted frogs, western tiger salamanders, and western toads occur in wetlands and ponds throughout Yellowstone. In 2014, the plains spadefoot (*Spea bombifrons*) was confirmed in Yellowstone through genetic analyses. Spadefoots are rarely seen because

Quick Facts

Number in Yellowstone
5 species: Western tiger salamander, boreal chorus frog, Western toad, Columbia spotted frog, and plains spadefoot.

Identification
Toads are not taxonomically different from frogs. The species called "toads" are associated with drier skin and more terrestrial habitats.

Status

- Columbia spotted and boreal chorus frogs are widely distributed with many breeding sites in the park.
- Western tiger salamanders are common and abundant on the northern range and in Hayden Valley.
- Western toads are abundant in some areas.
- None of the park's amphibians are federally listed as threatened or endangered.
- Scientists are concerned about the Western toad, which has declined sharply in other parts of the West.

Research

- 2000: Researchers begin inventorying amphibians.
- 2006: Long-term amphibian monitoring begins in Yellowstone.
- 2014: A breeding populaton of plains spadefoot (*Spea bombifrons*) was confirmed near Fountain Flat Drive.

Survival in winter
To survive the winter, some Yellowstone amphibians go into water that does not freeze (spotted frogs), others enter underground burrows (salamanders and toads), and others (boreal chorus frog) tolerate freezing and go into a heart-stopped dormancy for the winter in leaf litter or under woody debris.

they spend most daylight hours (and most of the year for that matter) underground. Currently, a single breeding population is known to exist within Yellowstone. However, monitoring efforts are under way to locate additional breeding sites because plains spadefoots typically do not disperse far from their natal pond.

In Yellowstone, amphibians depend on limited suitable habitat with shallow, quiet waters needed for egg laying and larval development. Annual differences in snowpack and precipitation change the extent and location of wetland sites, resulting in considerable year-to-year variation in amphibian reproduction. Breeding data collected across the park and since 2006 show that year-to-year variations in breeding are common. Multi-year monitoring data indicate that amphibian populations using small, shallow, isolated wetlands are most susceptible to drought or changes in precipitation. In contrast, amphibian populations occupying deeper wetlands and ponds appear to be more stable through time.

Since the 1950s, air temperatures have increased across this region and changes in the flooding patterns, or even the complete drying of wetlands, have been documented. Since 2006, annual visits to approximately 250 wetlands across Yellowstone have further documented annual variation in the availability of wetlands. These data suggest that in hot, dry years (e.g., 2007) upwards of 40% of the park's wetlands dry up. In cool, wet years (e.g., 2011), most wetlands across the park are flooded and available to support amphibian breeding. Further warming is anticipated for this region and could contribute to the drying of wetlands as well as influence the distribution and abundance of amphibians and other wetland-dependent species.

Disease agents, such as ranavirus and chytrid fungus (*Batrachochytrium dentrobatidis*), could also affect the survival and reproduction of amphibian populations in Yellowstone. Ranavirus has been found in tiger salamanders and Columbia spotted frogs collected from die-offs since 2008 and has also been involved with die-offs of all four widely distributed species in the region. Chytrid fungus usually appears in Columbia spotted frogs and western toads following metamorphosis and does not necessarily cause a fatal infection. The DNA of the chytrid fungus has been identified in skin swabs collected from both species in Yellowstone, though the impacts at the population level have not been determined. Since 2015, 44% of tissue samples (tail clips) collected from larval amphibians (frog and toad tadpoles) have tested positive for ranavirus. These findings highlight that several factors, including host susceptibility and environmental conditions, may determine whether an infection is lethal and results in a die-off or a decline in population abundance.

Amphibian or Reptile?

Both amphibians and reptiles are ectothermic ("cold-blooded"), meaning they derive body heat from outside sources rather than generate it internally. Reptiles have scaly, dry skin. Some lay eggs; others bear live young. Amphibians have thin, moist glandular skin permeable by water and gases. The young must pass through a larval stage before changing into adults. Amphibious means "double life" and reflects the fact that salamanders, toads, and frogs live in water as larvae and on land for much of the rest of their lives.

Studying Amphibians in Yellowstone

The Greater Yellowstone Network (GRYN) has led a collaborative monitoring of wetlands and amphibians in Yellowstone since 2006. Long-term monitoring of amphibian populations provides an opportunity to observe trends that may not be apparent at local scales or in areas with more direct human influences on habitat quality.

Amphibians are monitored at catchments (or watersheds) that average approximately 500 acres in size. On average, 31 catchments are revisited during annual monitoring visits (up to 24 in Yellowstone, and seven in neighboring Grand Teton National Park). All wetlands within the selected catchment are visited each summer, when two independent observers search for amphibians' breeding evidence (i.e., eggs, larvae, or recently metamorphosed individuals) and document important habitat characteristics and the presence or absence of surface water.

The objectives of GRYN's annual monitoring are to estimate the proportion of monitored catchments and wetlands used for breeding by each native amphibian species annually, to consider whether the rate and direction of use may be changing through time, and to document the number of wetlands within catchments that are potentially suitable for amphibian breeding.

This annual monitoring is then combined with local climate data to carefully examine the links among climate, wetlands, and amphibians. Taken

together, amphibian and wetland monitoring data from the past decade, coupled with local climate information, will help support predictions of amphibian occurrence under different climate scenarios.

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Western Tiger Salamander (*Ambystoma mavortium*)

Identification

- The only salamander species in Yellowstone.
- Adults range up to nine inches, including the tail.
- Head is broad, with a wide mouth.
- Color ranges from light-olive or brown to nearly black, often with yellow blotches or streaks on back and sides; belly is dull lemon yellow with irregular black spots.
- Aquatic larvae have a uniform color and large, feathery gills behind the head; they can reach sizes comparable to adults.

Habitat

- Breeds in deeper ponds and fishless lakes.
- Widespread in Yellowstone in a great variety of habitats, with sizable populations on the northern range.

Behavior

- Adult salamanders emerge from hibernation from late April to June, depending on elevation, and migrate to breeding ponds where they lay their eggs.
- Mass migrations of salamanders crossing roads are sometimes encountered, particularly during or after rain.
- After migration, returns to its moist home under a rock or log, and in rodent burrows.
- Feeds on adult insects, insect nymphs and larvae, small aquatic invertebrates, tadpoles, juvenile frogs and other small vertebrates.
- Preyed upon by a wide variety of animals, including mammals, fish, snakes, and birds such as sandhill cranes and great blue herons.

Boreal Chorus Frog (*Pseudacris maculata*)

Identification

- Adults reach one to 1.5 inches in length, and females are usually larger than males; newly metamorphosed juveniles are less than one inch long.
- Brown, olive, tan, or green (sometimes bicolored) with a prominent black stripe on each side from the nostril through the eye and down the sides to the groin; three dark stripes down the back, often incomplete or broken into blotches.

Habitat

- Common, but seldom seen due to its small size and secretive habits.
- Lives in moist meadows and forests near wetlands.
- Lays eggs in loose, irregular clusters attached to submerged vegetation in quiet water.

Behavior

- Breeds in shallow temporary pools or ponds during the late spring.
- Calls are very conspicuous and resemble the sound of a thumb running along the teeth of a comb.
- Males call and respond, producing a loud and continuous chorus at good breeding sites from April to early July, depending on elevation and weather.
- Usually calls in late afternoon and evening.
- Tadpoles eat aquatic plants; adults eat mostly insects.
- Eaten by fish, predacious aquatic insect larvae, other amphibians, garter snakes, mammals, and birds.

Western Toad (*Anaxyrus boreas*)

Identification

- Yellowstone's only true toad species confirmed to breed in the park.
- Adults range up to about four inches, juveniles just metamorphosed from tadpoles are only one inch long.
- Stocky body and blunt nose.
- Brown, gray, or olive-green with irregular black spots, lots of "warts," and usually a white or cream-colored stripe down the back.
- Tadpoles are usually black and often congregate in large groups.

Habitat

- Once common throughout the park, now appears to be much rarer than spotted frogs and chorus frogs; scientists fear this species has experienced a decline in the ecosystem.
- Adults can range far from wetlands because of their ability to soak up water from tiny puddles or moist areas.
- Lays eggs in shallow, sun-warmed water, such as ponds, lake edges, slow streams, and river backwaters.

Behavior

- Tadpoles eat aquatic plants; adults eat algae, insects (particularly ants and beetles), worms, and other small invertebrates.
- Sometimes active at night.
- Defends itself against predators by secreting an irritating fluid from numerous glands on its back and behind the eyes.
- Eaten by snakes, mammals, ravens, and large wading birds.

Columbia Spotted Frog (*Rana luteiventris*)

Identification

- Common in deeper wetlands and beaver ponds.
- Maximum length is about 3.5 inches, newly metamorphosed juveniles less than one inch long.
- Upper surface of the adult is gray-brown to dark-olive to green, with irregular black spots; skin is bumpy; underside is cream-colored and may be splashed with brilliant orange on the thighs and arms.
- Tadpoles have long tails and may grow to three inches long.

Habitat

- Found all summer along or in rivers, streams, smaller lakes, marshes, ponds, and rain pools.
- Lays eggs in stagnant or quiet water, in globular masses surrounded by jelly.

Behavior

- Breeds from April to early June, depending on temperatures and elevation.
- Tadpoles metamorphose between July and September.
- Tadpoles eat aquatic plants; adults eat mostly insects but, like many other adult amphibians, are highly opportunistic in their food habits.

Plains Spadefoot Toad (*Spea bombifrons*)

Identification

- A single breeding population has been identified in the Lower Geyser Basin east of Fairy Creek.
- Protruding eyes with vertical pupils, a prominent bony boss (raised bump) between the eyes.
- Has a single, dark tubercle, or "spade," on each of the hind feet.

Habitat

- Uses its spade to dig shallow summer burrows or deeper winter burrows. Newly metamorphosed animal may burrow in mud near its natal pond or hide in cracks in the hard earth.
- Typically occurs in warmer climates in the western United States. Scientists speculate that spadefoots are found in geothermally influenced habitat in Yellowstone because the warmer ambient conditions facilitate overwinter survival.

Behavior

- Breeds in ephemeral pools following significant rainfall.
- Tadpoles develop from eggs in two to six days.
- Produces cannibalistic and noncannibalistic tadpole body types.
- Tadpoles develop for three to six weeks before metamorphosis.

Reptiles are not well studied in Yellowstone National Park. The bullsnake (shown here) is one of six, and the largest, reptile species found in the park.

Reptiles

Yellowstone provides a valuable area for the study of reptiles. Information about the status and trends of reptiles here may shed light on declines documented in other high-elevation protected areas of the western United States. Many reptiles congregate to breed or overwinter, and they can be adversely affected by disturbance or loss of key sites.

Quick Facts

Number in Yellowstone

Reptiles are less studied than amphibians in Yellowstone. There are 6 confirmed species:

- bullsnake
- prairie rattlesnake
- rubber boa
- sagebrush lizard
- common garter snake
- terrestrial garter snake.

Status

- None of the park's reptiles are federally listed as threatened or endangered.
- Researchers began inventorying reptiles and amphibians in 2000.

Bullsnake (*Pituophis catenifer sayi*)

Identification

- A subspecies of the gopher snake is Yellowstone's largest reptile, ranging from 50 to 72 inches long.
- Yellowish with a series of black, brown, or reddish-brown blotches down the back; the darkest, most contrasting colors are near the head and tail; blotches are shaped as rings around the tail.
- Head resembles a turtle's in shape, with a protruding scale at the tip of the snout and a dark band extending from the top of the head through the eye to the lower jaw.

Habitat

- In Yellowstone, found at lower elevations; in drier, warmer climates; and in open areas , e.g., near Mammoth.

Behavior

- Lives in burrows and eats small mammals—behavior that gave the gopher snake its name.
- Often mistaken for a rattlesnake because of its appearance and its defensive behavior: when disturbed, it will coil up, hiss loudly, and vibrate its tail against the ground, producing a rattling sound.

Prairie Rattlesnake (*Crotalus viridis*)

Identification

- Can be more than 48 inches in length.
- Greenish-gray to olive green, greenish-brown, light-brown, or yellowish with dark brown splotches down its back that are bordered in white.

Habitat and Behavior

- Only dangerously venomous snake in the park.
- Lives in the lower Yellowstone River areas of the park, including Reese Creek, Stephens Creek, and Rattlesnake Butte, where the habitat is drier and warmer than elsewhere in the park.
- Usually defensive rather than aggressive.
- Only two snake bites are known during the history of the park.

Rubber Boa (*Charina bottae*)

Identification

- Infrequently encountered in Yellowstone, perhaps due to its nocturnal and burrowing habits.
- One of two species of snakes in the United States related to tropical boa constrictors and pythons.
- Maximum length of 28 inches.
- Back is brown or greenish-brown, belly is lemon-yellow; scales are small and smooth, making it almost velvety to the touch.

Habitat and Behavior

- Eats small prey including mammals, amphibians, lizards, other snakes, and even small birds.
- May spend great deal of time partially buried under leaves and soil, and in rodent burrows.
- Usually found in rocky areas near streams or rivers with shrubs or trees nearby.
- Recent sightings have occurred in the Bechler region, Gibbon Meadows, and Old Faithful.

Similar species:

The racer (*Coluber constrictor)* can be found from southern British Columbia, east to Maine, and south across the United States to southern Florida and southern California. Racers, as their name implies, are fast and sleek snakes, unlike the slow-moving rubber boa.

Racers also have larger eyes than rubber boas and round pupils. Any sightings of this species should be reported to resource managers.

Sagebrush Lizard (*Sceloporus graciosus*)

Identification

- Only lizard in Yellowstone.
- Maximum size of five inches from snout to tip of the tail; males have longer tails and may grow slightly larger than females.
- Gray or light brown with darker brown stripes on the back set inside lighter stripes on the sides, running the length of the body; stripes not always prominent and may appear as a pattern of checks down the back; underside usually cream or white.
- Males have bright-blue patches on belly and on each side, with blue mottling on the throat.

Habitat

- Usually found below 6,000 feet but in Yellowstone can live at elevations up to 8,300 feet.
- Populations living in thermally influenced areas are possibly isolated from others.
- Most common along the lower portions of the Yellowstone River near Gardiner, Montana, and upstream to the mouth of Bear Creek; also occurs in Norris, Shoshone, and Heart Lake geyser basins, and in other hydrothermal areas.

Behavior

- Comes out of hibernation about mid-May and is active through mid-September.
- Diurnal, generally observed during warm, sunny weather in dry, rocky habitats.
- During the breeding season, males do push-ups on elevated perches to display their bright-blue side patches to warn off other males.
- Feed on various insects and arthropods.
- Eaten by bullsnakes, terrestrial gartersnakes, prairie rattlesnakes, and some birds.
- May shed tail when threatened or grabbed.

Valley Gartersnake (*Thamnophis sirtalis fitchi*)

Identification

- Medium-sized snake up to 34 inches long.
- Nearly black or dark green base color with three bright yellow stripes running the length of the body; underside is pale yellow or bluish-gray.
- Most distinguishing characteristics of this species in this region are the irregular red spots along the sides.

Habitat

- Thought to be common in the past, now in decline for no apparent reason.
- Closely associated with permanent surface water.
- In Yellowstone area, observed only in the Falls River drainage in the Bechler region and three miles south of the south entrance along the Snake River.

Behavior

- Generally active during the day.
- In the Yellowstone area, it eats mostly toads, chorus frogs, fish remains, and earthworms; can eat relatively poisonous species. Reliance on amphibian prey may contribute to reports of decline of this species in the greater Yellowstone area.
- Predators include fish, birds, and carnivorous mammals.

Wandering Gartersnake (*Thamnophis elegans vagrans*)

JEFF ARNOLD

Identification

- Most common reptile in the park.
- Six to 30 inches long.
- Brown, brownish-green, or gray with three light stripes—one running the length of the back and one stripe on each side.

Habitat

- Usually found near water in all areas of the park.
- Eats small mammals, fish, frogs, tadpoles, salamanders, earthworms, slugs, snails, and leeches.

Behavior

- May discharge musk from glands at the base of the tail when threatened.
- Gives birth to as many as 20 live young in late summer or fall.

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Carabid beetle

Insects

There are approximately 1.5 million described insect species in the world--three times the number of all other known species combined. Insects provide many critical ecosystem services, including pollinating native plant communities; providing a food source for hundreds of bird, amphibian, reptile, and mammal species; acting as primary and secondary decomposers; recycling nutrients to create organic soil; acting as predators and parasites to keep pest species in check; and providing economic benefits through crop pollination, honey, wax, silk, and other products. Despite these crucial functions, until recently insects in Yellowstone National Park were studied only opportunistically through external research projects.

Over the last several decades, insect studies have been conducted to document easily recognizable groups. The majority of groups, even at the order-level, remain understudied. Yellowstone has genus or species level records for the following orders:

- Coleoptera (beetles)—487
- Hymenoptera (bees, wasps, ants, and sawflies)—67 (365)
- Orthoptera (grasshoppers and cicadas)—51
- Diptera (true flies)—403
- Ephemeroptera (mayflies)—72
- Hemiptera (true bugs)—38
- Lepidoptera (moths and butterflies)—237
- Odonata (dragonflies)—47
- Plecoptera (stoneflies)—92
- Trichoptera (cad flies)—141
- Megaloptera (alderflies)—2

Quick Facts

- Insect diversity, abundance, trends, and baseline species list remain largely unknown.
- Until recently insects in Yellowstone were studied only opportunistically through external research projects.
- In 2018, The National Environmental Observatory Network (NEON) began to monitor ground beetle diversity, mosquitoes, and tick-borne disease in the park.
- YNP staff are replicating the NEON beetle monitoring protocols at seven Northern Range sites.
- There are approximately 1.5 million described insect species in the world--three times the number of all other known species combined.
- Insects provide many critical ecosystem services, including pollination, providing a food source, acting as decomposers, recycling nutrients, and acting as predators and parasites.

Recent analysis of a 27-year study in Germany, which is illustrative of global trends possibly found in Yellowstone National Park, documented an 82% mid-summer decline in flying insect biomass regardless of habitat type and unexplained by changes in weather, land use, or habitat characteristics. Except for a few groups like butterflies, bees and beetles, Yellowstone National Park insect diversity, abundance, trends, or baseline species lists remain largely unknown. Studies in the park have included the following: investigation of the respiratory physiology and thermal preference of water scavenger beetles in thermal features (2011–2013); benthic macroinvertebrate surveys to detect aquatic invasive species; annual butterfly counts (2003–ongoing); a thermal area tiger beetle project to investigate heavy metal metabolization (2017–ongoing); analysis of dragonfly larvae to detect methylmercury levels (2013–ongoing); a Bioblitz that documented 391 species (2009); a project that studied bee diversity and documented

350 species (2010–2012); and several insect studies that examined the effects of the 1988 fires and more recent beetle-kill forest die-offs. Recently, the western bumblebee (*Bombus occidentalis*), has become a candidate for listing under the Endangered Species Act, so a survey to document its occurrence in the park was conducted in 2017. Two high-elevation stoneflies, *Lednia tumana* and *Zapada glacier* are also candidate species for "Threatened" status.

In 2018 The National Environmental Observatory Network (NEON) initiated a 30-year project to monitor ground beetle diversity, mosquitoes, and tick-borne disease occurrence in the park. Yellowstone staff are replicating the NEON beetle monitoring protocols at seven Northern Range climate monitoring sites across an elevation gradient from 5,300 feet to 9,500 feet. This effort will examine a sentinel taxa (*Carabidae*) to infer population trends across other insect groups. Park staff are also collaborating with the Department of Agriculture to monitor grasshoppers, a potentially significant herbivore. It is currently unknown how the combination of climate change and the spread of invasive plant species will affect insects and native plant pollination, which are key to ecosystem functions supporting ungulate and bird habitat. Monitoring representative insect groups to detect changes over time is important. These studies will inform management actions to mitigate potential species loss.

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