Yellowstone National Park
Yellowstone Bear Program 2019
Wyoming, Montana, Idaho

Yellowstone Center for Resources
National Park Service
Department of the Interior

# Yellowstone Bear Project Annual Report

2019

## Summary

In 2019, the Greater Yellowstone Ecosystem (GYE) grizzly bear population was estimated at 737 bears occupying 26,539 square miles. These estimates are considerably higher than the 136 bears occupying 5,955 square miles in 1975 when grizzlies were listed as a threatened species.

To promote human safety and prevent human-causes of grizzly bear mortality, park and Bear Management Office staff spent considerable time implementing actions designed to prevent bear-human conflicts from occurring. Management actions included removing ungulate carcasses from visitor use areas, hazing bears out of developments, installing bear-proof food storage lockers in campsites, posting temporary warnings and area closures, and managing the human-bear interface at roadside bear viewing opportunities. These efforts were highly successful at preventing conflicts from occurring. Only 1 grizzly conflict, 7 black bear conflicts, and 4 conflicts where the species of bear could not be determined were reported in 2019. The low number of conflicts is a remarkable achievement considering Yellowstone National Park (YNP) currently receives over four million visits per year. Although grizzly bear cub production in the park in 2019 was lower than the long-term average, grizzly bear mortalities were also low, with only one known grizzly bear mortality (a natural death) being recorded.

## Bear Sightings

There were 1,838 opportunistic bear sightings reported in YNP in 2019. These reports included 721 observations of grizzly bears and their tracks (figure 1), 1,053 observations of black bears and their tracks (figure 2), and 64 reports where the species of bear could not be determined. The number of black bear sightings reported in 2019 was higher than the long-term average recorded from 1984 to 2018, and the number of grizzly bear sightings was slightly below average (figure 3).

The first grizzly bear observation of the year was recorded on March 8 near Mud Volcano. The first female grizzly with newborn cubs was observed near Echo Canyon on April 24. The first black bear of the year was observed near the Mammoth Hoodoos during warm weather on January 15. The first black bear observed during the spring period of den emergence was sighted on March 24 in the Geode Creek drainage. The first sighting of a female black bear with cubs was on April 21 at Rainy Lake. The last grizzly bear with cubs observed was sighted on October 5 on Craig Pass. The last grizzly bear sighting of the year was an observation of an adult grizzly scavenging on the remains of elk carcass it had taken from a pack of 17 wolves in the Hellroaring Creek drainage on December 30. The last black bear with cubs was observed on October 7 in the Oxbow Creek drainage. The last black bear observation of the year was on December 22 in the Gardner River canyon.

Based on opportunistic bear observations, we detected some evidence that the period in which grizzly bears were active on the landscape in YNP was getting longer. From 1983 to1989, the average date of the first observed grizzly bear activity of the year was March 16th. From 2010 to 2019, the average date of the first observed grizzly bear activity was February 28th, 16 days earlier than in the 1980s (figure 4). In the 1980s, the average date of the last observed grizzly activity of the year was November 25th. From 2010 to 2019, the average date of the last observed grizzly activity of the year was December 9th, 14 days later than the average date observed in the 1980s (figure 5). Although there is substantial uncertainty around this trend because it was based on opportunistic sightings and our decade averages had wide confidence intervals, grizzly bears were observed active on the landscape for approximately 30 days longer during the most recent decade (2010-2019) when compared to the 1980s. In contrast, the period of observed black bear activity decreased by approximately 18 days from the 1980s to the current decade (figures 4 and 5).

## Management of Roadside Bear Viewing

Viewing bears along roads is one of the primary activities of park visitors and contributes millions of dollars to the economies of gateway communities annually. In 2019, park staff and visitors reported 1,170 roadside traffic-jams caused by visitors stopping to view human-habituated bears along roads. Traffic jams included 333 caused by grizzly bears, 833 by black bears, and 4 bear jams where the species of bear involved was not reported. The numbers of traffic jams caused by grizzly bears and black bears in 2019 were higher than the 36-year average for each species recorded from 1983 to 2019 (figure 6). Thousands of visitors viewed bears at bear jams in 2019. Park staff responded to 226 (68%) of the grizzly bear caused traffic jams and spent 1,041 staff hours managing the bears, traffic associated with the bear jams, and visitors that stopped to view and photograph the grizzly bears involved. On average, park staff spent 4.6 hours managing each grizzly bear-caused traffic jam. Park staff responded to 738 (89%) of the black bear caused traffic jams and spent 1,806 staff hours managing them. On average, park staff spent approximately 2.5 hours managing each black bear caused traffic jam.

(FRONT COVER) Standing up on two legs is a curious or information gathering posture, allowing bears to better smell, hear, and see what has startled them. The bear is trying to determine what you are and what your intentions are before deciding how to react to the encounter. Photo © A. Oliver.

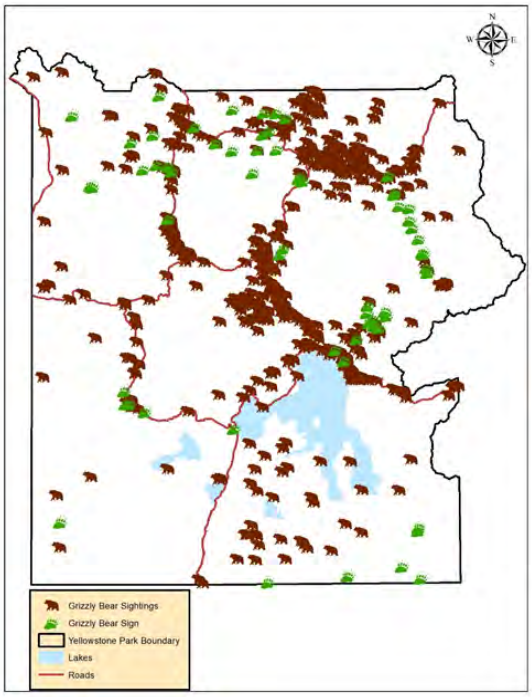


Figure 1. Opportunistic observations of grizzly bears and their tracks reported in Yellowstone National Park, 2019.

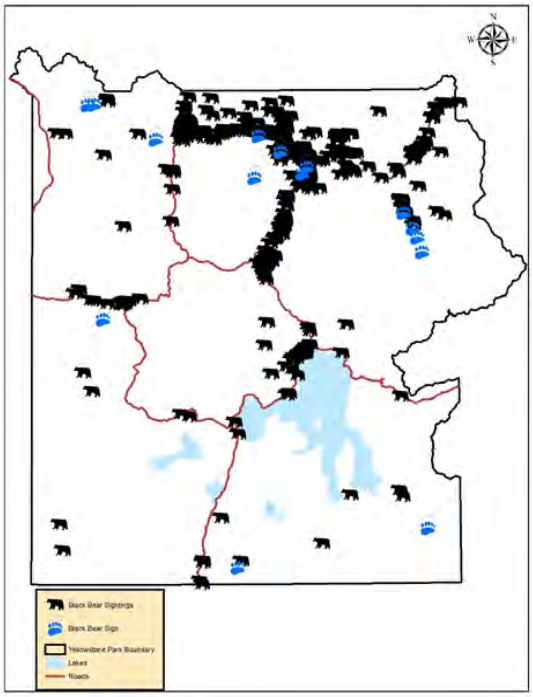


Figure 2. Opportunistic observations of black bears and their tracks reported in Yellowstone National Park, 2019.

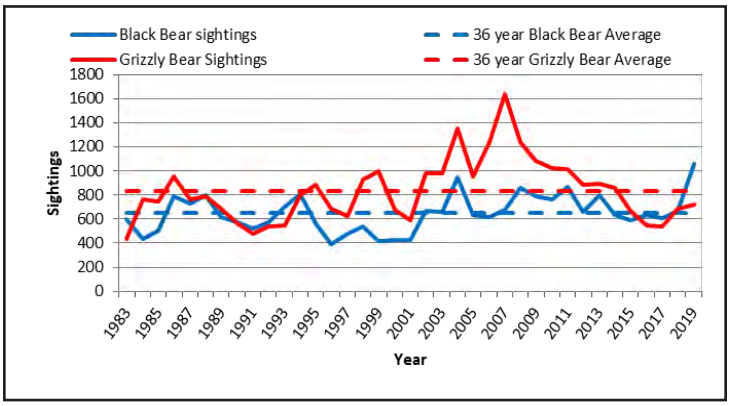


Figure 3. Number of opportunistic grizzly and black bear observations (solid lines) and the annual average number of grizzly and black bear observations (dashed line) in Yellowstone National Park, 1983-2019.

Bear Management Technician Brady Dunne managing the human-bear interface at a roadside bear jam along the Mammoth to Norris Road.

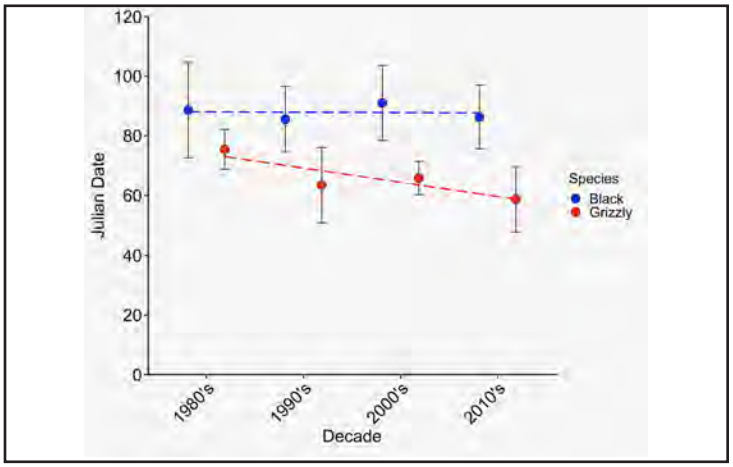


Figure 4. Average Julian date of the first grizzly bear (red circles) and black bear (blue circles) observations of the year in Yellowstone National Park, by decade, 1983-2019. The whiskers represent ± 1 standard deviation.

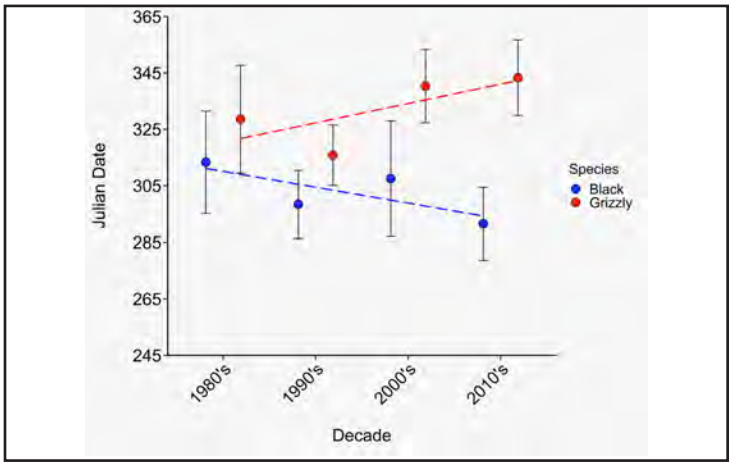


Figure 5. Average Julian date of the last grizzly bear and black bear observations of the year in Yellowstone National Park, by decade, 1983-2019. The whiskers represent ± 1 standard deviation.

Bear Management Technician Amanda Bramblett horse-packing in to Big Game Ridge, a remote backcountry area of the park to conduct whitebark pine cone production transects. Cone production was lower than the long-term average in 2019.

## Bear Observation Flights

We flew two rounds of fixed-wing observation flights over eight Bear Observation Areas (BOAs) in 2019. We conducted the first round of flights from June 9 through June 15 and the second round from July 4 through July 11. The total duration of observation flight time was 18.8 hours for Round 1 and 21.6 hours for Round 2. Flight duration totaled 40.4 hours. Observation flight duration averaged 2.5 hours per BOA. Excluding dependent young (cubs, yearlings, two-year-olds), we observed 37 independent age grizzly bears during Round 1 and 43 in Round 2. For Round 1, female grizzlies with dependent young observed included 2 females with cubs, 5 females with yearlings, and 5 females with two-year-olds. For Round 2, 3 female grizzlies with cubs and 4 females with yearlings were observed. We counted a total of 4 cubs, 9 yearlings, and 7 dependent two-year-olds in Round 1, and a total of 5 cubs and 8 yearlings in Round 2. We observed two (3%) grizzly bears with radio collars. We observed approximately 2.0 independent age (adults and weaned subadults) grizzlies and 0.5 female grizzlies with dependent young (cubs, yearlings, two-year-olds) per flight hour. Both the number of independent age grizzly bears (figure 7) and the number of female grizzlies with young (figure 8) observed in 2019 were slightly higher than the 22-year average recorded from 1997 to 2019.

Excluding dependent young, we sighted 22 black bears during observation flights. These sightings included 21 adult and subadult bears without dependent offspring and 1 female with a yearling. We observed one (5%) radio-collared black bear. We observed approximately 0.5 independent age black bears and 0.03 female black bears with dependent young per flight hour. The number of independent age black bears observed per hour was slightly higher than the 22-year average (figure 7). The number of females with young observed per hour was comparable to the long-term average (figure 8).

## Bear Cub Production

Based on ground and aerial observations, an estimated minimum of 7 unique adult female grizzly bears produced litters of cubs inside the park in 2019. These 7 females produced at least 16 cubs (some cubs may have died prior to initial observation). Average litter size was 2.3 cubs per litter. There were 5 litters of twins and 2 litters of triplets observed. No single-cub litters or litters larger than 3 cubs were observed in 2019. The 7 females with cubs observed in 2019 was below the 32-year average of 11.9 litters observed per year from 1988 to 2019 (figure 9). The total number of grizzly cubs produced was also lower than the long-term average (figure 10). The average litter size observed in 2019 was higher than the long-term average (figure 11). On average,

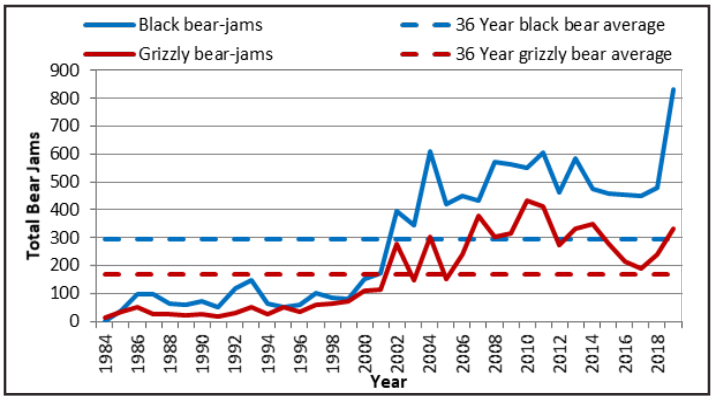


Figure 6. Number of grizzly bear and black bear caused traffic jams reported in Yellowstone National Park, 1984-2019.

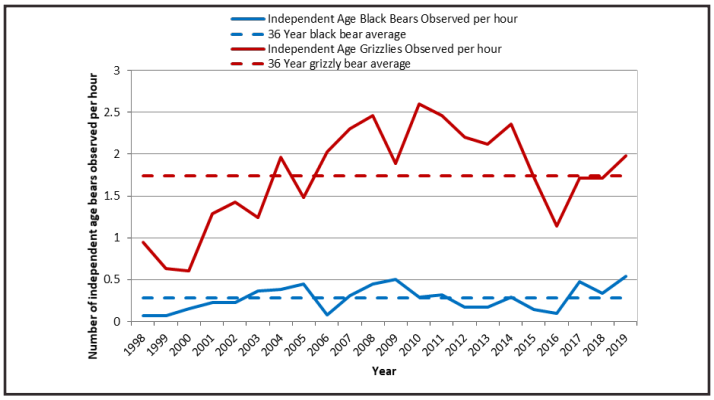


Figure 7. Number of independent age (adults and weaned subadults) grizzly bears and black bears observed per flight hour (solid lines) and the annual average number of grizzly and black bear observed per flight hour (dashed line) during bear observation flights in Yellowstone National Park, 1998- 2019.

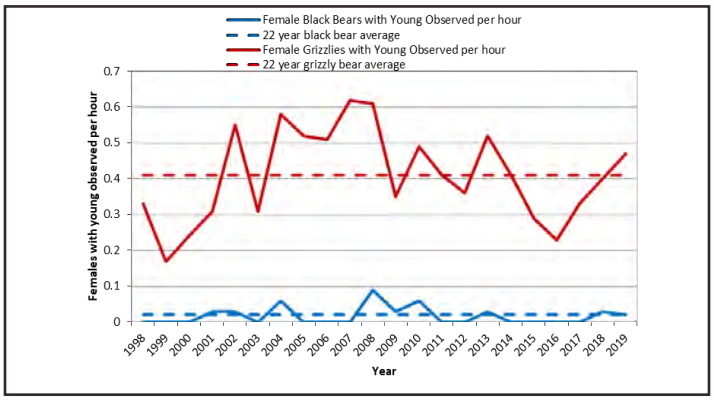


Figure 8. Number of female grizzly bears and black bears accompanied by young (cubs, yearlings, two-year-olds) observed per flight hour (solid lines) and the annual average number of female grizzly and black bears accompanied by young observed per flight hour (dashed line) during bear observation flights in Yellowstone National Park, 1998-2019.

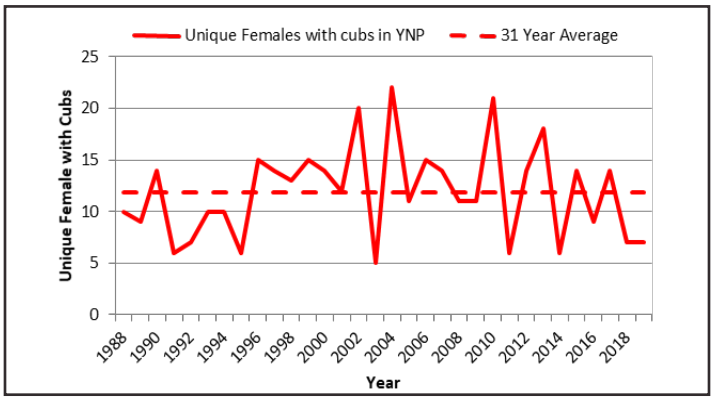


Figure 9. Annual number of unique adult female grizzly bears that produced litters of cubs (solid line) and long-term average number of litters counted per year (dashed line) in Yellowstone National Park, 1988-2019.

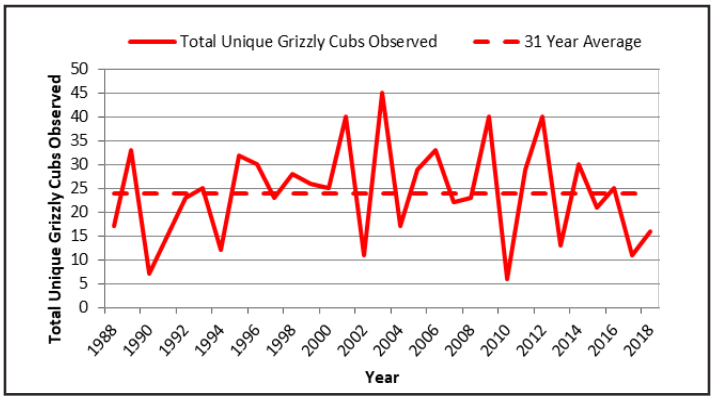


Figure 10. Total number of unique cubs counted (solid line) and long-term average total number of cubs counted per year (dashed line) in Yellowstone National Park, 1988-2019.

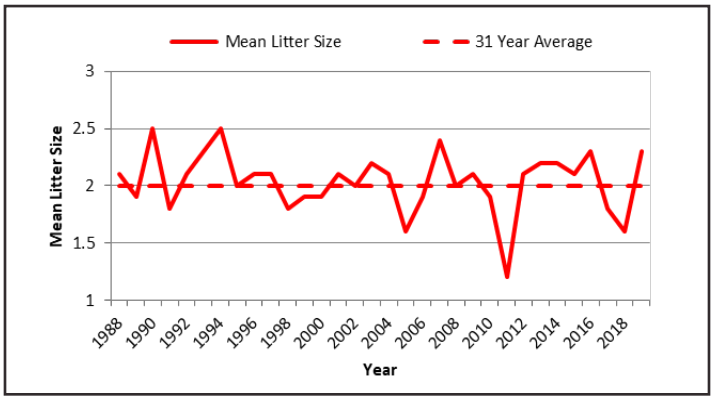


Figure 11. Annual number of cubs per litter (solid line) and long-term average annual litter size (dashed line) observed in Yellowstone National Park, 1988-2019.

adult female grizzly bears in the GYE produce a litter of cubs approximately once every three years. Combining the counts of females with cubs from the most recent 3-year period (2017–2019) provides a minimum estimate of 28 adult female grizzly bears with home ranges wholly or partially within the park.

Based on opportunistic observations, an estimated minimum of 17 unique adult female black bears produced cubs inside YNP in 2019. These 17 females produced at least 32 cubs. Average litter size observed was 1.9 cubs per litter. There were 4 one-cub, 11 two-cub, and 2 three-cub litters observed. No litters larger than 3 cubs were observed. One radio-collared female was observed with 2 cubs.

## Bear Mortalities

There was one known grizzly bear death in YNP in 2019. The mortality was due to natural causes. On October 7, 2019, at 0730 hours, a large male grizzly bear was observed feeding on a two- to three-year-old male bear in brush and downfall adjacent to the East Entrance Road. The large male grizzly bear scavenging the carcass was wearing a radio-collar. Telemetry indicated the scavenging bear was adult male Grizzly Bear #791. The dead bear's zygomatic arches were crushed and there were large canine punctures to both dorsal orbits. The subadult's mandible articulations were also crushed. The dead bear had multiple bites with 65- 75 mm canine widths on the head and down the dorsal back with associated subcutaneous hemorrhages.

Trends in causes of grizzly bear deaths inside YNP have changed over time. From the late 1950s through the 1970s most grizzly bear mortality in the park was due to human causes (figure 12), primarily management removals of bears involved in bear-human conflicts. In recent decades (1980-2019), most grizzly bear mortality in the park is from natural causes, primarily old age, and predation by other bears and wolves.

Four black bear mortalities were reported in 2019. On June 11, backcountry rangers shot a ~100-pound black colored female black bear in backcountry campsite 1R3. The bear had bitten a woman sleeping in her tent in the campsite at 0530 on June 6. On July 7, a 46-pounds black colored yearling female black bear jumped off a rock beside the Tower to Canyon road and was struck and killed by a passing vehicle. On July 10, Bear Management staff shot a five-year-old reddish-brown colored male black bear near backcountry campsite 3L2. The bear, estimated at 175 pounds, was killed because of its bold and aggressive behavior toward people in campsites 3L2 and 3L3. The bear had also obtained significant human food rewards in campsite 3L3. On August 16, a 188-pound reddish-brown colored adult female black bear was hit and killed by a vehicle near Undine Hill on the Mammoth to Tower Road.

## Bear-Human Conflicts

Twelve bear-human conflicts were reported in YNP in 2019 (table 1, figure 13). Grizzly bears were involved in 1 conflict, black bears in 7, and in 4 conflicts the species of bear involved could not be determined. In the grizzly bear incident, a bear consumed soy-gluten pellets used in the non-native Lake Trout control project that had been spilled at the Grant

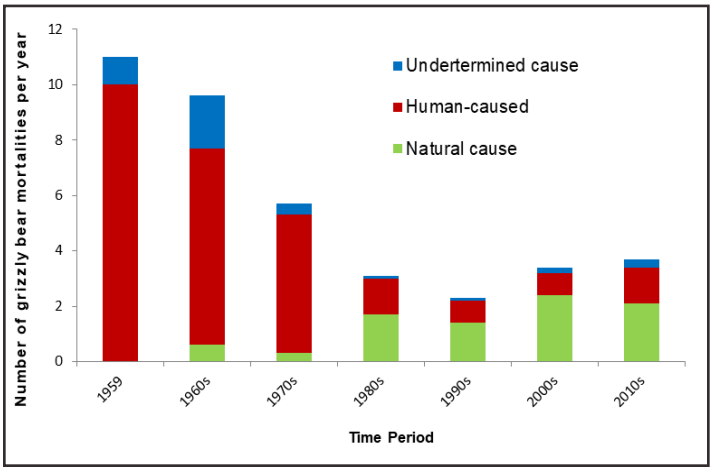


Figure 12. Number of known and probable grizzly bear mortalities in Yellowstone National Park by time period, 1959-2019.

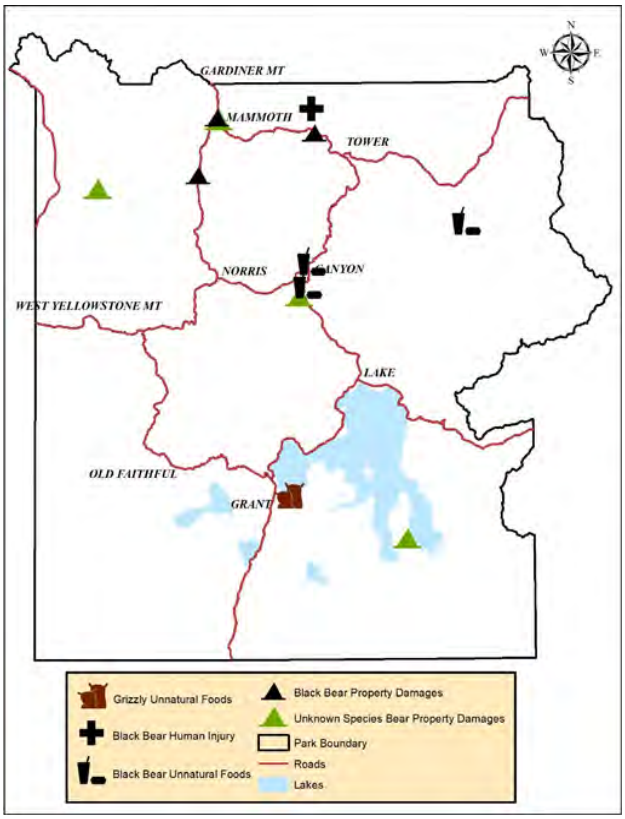


Figure 13. Locations of bear-human conflicts caused by grizzly bears, black bears, and unidentified species of bears reported in Yellowstone National Park, 2019.

Village helicopter base. The annual number of grizzly bear-human conflicts in the park has decreased significantly after efforts to prevent bears from obtaining human foods were implemented in the late 1960s and early 1970s (figure 14).

Black bear conflicts included 3 incidents where bears obtained human foods, 3 incidents where they damaged property without obtaining a food reward, and 1 human injury in a backcountry campsite. In addition, there were 3 incidents of property damage without food reward where the species of bear could not be determined.

## Bear Management Actions

Although grizzly bears caused few conflicts in the park in 2019, park staff dedicated considerable management effort toward preventing conflicts from occurring (table 2). Because of grizzly bear activity in visitor use areas, staff posted bear warning signs at 12 locations and temporary area or trail closure signs at 25 locations. In addition, staff removed 101 large mammal carcasses from visitor use areas so they would not attract grizzly bears. To prevent the need to capture and relocate or remove bears, biologists and rangers hazed grizzly bears out of human use areas 33 times, including from park developments 5 times, primary roads 26 times, and from picnic areas and high use trails 1 time each. Biologists did not capture, relocate, or remove any grizzly bears in management actions in 2019.

Due to black bear activity in visitor use areas, park staff posted bear warning signs at 9 locations and temporary area or trail closure signs at 12 locations (table 2). Park staff hazed black bears from visitor use areas 130 times, including 62 times from developments, 61 times from primary roads, 5 times from picnic areas, and 2 times from high-use trails. Rangers and Bear Management staff killed two black bears for exhibiting aggressive behavior in backcountry campsites.

## Bear-Human Interactions in Backcountry Areas

Most bear-inflicted human injuries occur in backcountry areas of the park and result from surprise encounters when hikers startle bears. To determine the behavioral response of bears to encounters with hikers, we record information on the outcomes of reported encounters between bears and hikers in backcountry areas.

### *Activity of Bears in Occupied Backcountry Campsites*

Bears occasionally enter designated backcountry campsites while the campsites are occupied by recreational users. In 2019, there were 6 incidents reported where grizzly bears entered occupied backcountry campsites. The bears' primary activity in the core camp was reported for all 6 incidents. Reported activities of bears in occupied campsites included walking through the core campsite (4), foraging on native foods (1), and investigating the food storage pole without getting a food reward (1).

People reported 13 incidents where black bears entered occupied backcountry campsites, including walking through the core camp (3), foraging natural foods in the core camp (3), investigating the food hanging pole without obtaining

A grizzly bear foraging vegetation in Yellowstone National Park. Grizzly bears are omnivore generalists that eat a wide variety of plants, insects, small mammals, and ungulates (bison, moose, elk, and deer). Photo © J. Hadley.

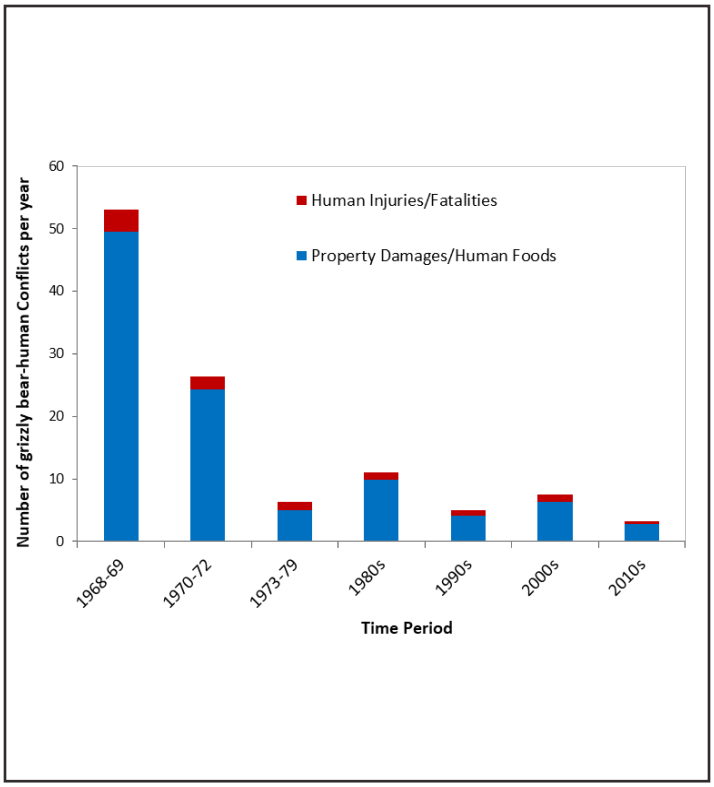


Figure 14. Number of grizzly bear-human conflicts reported in Yellowstone National Park by time period, 1968-2019.

food (1), investigating the fire ring (1), damaging property (1), usurping people's food (1), aggressively approaching people in the core camp (2), and biting a person who was inside their tent (1).

### *Bears Reactions to the Presence of People in Backcountry Campsites*

In 4 of the 6 incidents where grizzly bears entered occupied backcountry campsites, the campers believed the bear knew people were present in the campsite. The bears' reaction was reported in all 4 of these incidents. Grizzlies had no overt response in 1 (25%) incident, a flight response in 2 (50%) of the encounters and were curious and approached people during 1 (25%) encounter. Grizzlies did not injure any visitors in backcountry campsites in 2019.

In 11 of the 13 incidents where black bears entered occupied backcountry campsites, the occupants believed the bear was aware of their presence. Black bears reacted with no overt response in 6 (55%) incidents, by running away in 2 (18%) incidents, curiously approaching in 1 incident, stalking people in 1 incident, and biting someone inside of a tent in 1 incident.

Table 1. Number of bear-human conflicts in Yellowstone National Park, 2019.

| Type of Bear-Human Conflict | Grizzly Bear | Black Bear | Unidentified Bear | Total |
|---|---|---|---|---|
| Property damage without food reward | 0 | 3 | 4 | 7 |
| Property damage with human food reward | 1 | 3 | 0 | 4 |
| Human injury | 0 | 1 | 0 | 1 |
| Human fatality | 0 | 0 | 0 | 0 |
| Total conflicts | 1 | 7 | 4 | 12 |

Table 2. Number of bear management actions taken to reduce the chances of bear-human conflicts in Yellowstone National Park, 2019.

| Management action | Grizzly Bear | Black Bear | Unidentified Bear | Total |
|---|---|---|---|---|
| Area bear warnings posted | 12 | 9 | 1 | 22 |
| Area closure posted | 25 | 12 | 0 | 37 |
| Large animal carcass removal | 101 | - | - | 101 |
| Bear jam management | 226 | 738 | 3 | 967 |
| Hazing | 33 | 130 | 1 | 164 |
| Capture for humane reasons | 0 | 0 | 0 | 0 |
| Attempt management capture – not successful | 0 | 1 | 0 | 1 |
| Capture, mark, and release on site | 0 | 0 | 0 | 0 |
| Capture, mark, and relocate | 0 | 0 | 0 | 0 |
| Management removal (kill or send to zoo) | 0 | 2 | 0 | 2 |
| Total | 397 | 892 | 5 | 1,294 |


Bear Management Technicians Dylan Schneider (left) and Travis Wyman (right) complete installation of a "Be Bear Aware – Food Storage Required" sign at the Slough Creek Campground. Actions to prevent human-bear conflicts are a vital component of YNP's Bear Management Program. NPS photo – J. Mills

There were 47 reported human-grizzly bear encounters in Yellowstone National Park's backcountry in 2019, 28 occurred along trails, 15 in off-trail areas, and 4 in backcountry campsites. Despite their ferocious reputations, none of the encounters between grizzly bears and backcountry recreationalists in 2019 resulted in bear attacks. NPS photo – D. Schneider.

### *Bears Reactions to Encounters with People on Backcountry Trails*

In 2019, there were 28 reported incidents where people encountered grizzly bears on backcountry trails. Reactions of bears to the encounters were reported for all 28 incidents. Grizzly bears reacted to encounters with people along backcountry trails with neutral behaviors in 11 incidents (39%), flight behaviors in 10 (36%), curiously approaching in 4 (14%), charging without making contact in 2 (7%), and stress/warning behaviors in 1 (4%). Grizzlies did not injure any visitors on backcountry trails in 2019.

People reported 21 encounters with black bears on hiking trails. Black bears reacted by fleeing in 11 (52%) encounters, no overt response in 8 (38%) encounters, and approaching or following people in 2 (10%) encounters.

### *Bear Reactions to Encounters with People in Off-Trail Backcountry Areas*

In 2019, there were 15 reported incidents where people encountered grizzly bears while traveling off-trail in backcountry areas. The reaction of the bears to the encounters were reported in 13 of the incidents and included fleeing in 9 incidents (69%), charging without making contact in 2 (15%), neutral behaviors in 1 (8%), and with stress/warning behaviors in 1(8%). Grizzly bears did not attack people in any of the off-trail encounters in YNP in 2019.

People reported 11 encounters with black bears in off-trail areas. Black bears reacted with no overt response in 6 (55%) encounters, fleeing in 4 (36%) encounters, and curiously approaching people in 1 (9%) encounter.

## Risk of Bear Attack

Although bear attacks on visitors are rare, they generate intensive media attention when they occur. Intensive media coverage of these incidents often leads to fear being the primary influence on the public's perceptions of the risk of bear attack. To put the actual risk of bear attack in YNP into perspective, we calculated the chances of bear attack for visitors engaged in different types of recreational activities in different areas of the park.

From 1979 through 2019, bears injured (40) or killed (5) a total of 45 visitors in YNP. Bear attacks included 37 by grizzly bears, 5 by black bears, and 3 by bears where the species was not determined. During this time, 122,936,506 recreational visits were made to the park. The injury rate by grizzly and black bears combined was 1 visitor injured for every 2.7 million recreational park visits (table 3). However, not all visitors had equal exposure to the risk of bear attack. For visitors that remained within developments, along roadsides, and on front-country boardwalk trails while in the park, there was 1 grizzly bear attack per 61.5 million visits and 1 black bear attack per 122.9 million visits. For visitors camping in roadside campgrounds, there was 1 grizzly attack per 27.2 million overnight stays. No visitors were injured by black bears in automobile campgrounds from 1979 to 2019. For visitors camping in backcountry campsites, there was 1 grizzly attack per 1.7 million overnight stays and 1 black bear attack per 850,005 overnight stays. The park does not keep records of the number of backcountry day-use recreationalists (day-hikers, photographers, anglers, birders, etc.) traveling by foot. However, we estimated their numbers by using the ratio of day-hikers to overnight backpackers observed during trailhead bear spray surveys (13.6:1) conducted from 2011 to 2019. For day-hikers who generally don't travel as far into the backcountry as overnight backpackers, we estimated the risk of attack at approximately 1 bear-inflicted injury per 338,689 backcountry recreation days. Overnight backpackers (injured while hiking, not while in their campsites), who generally travel further into the backcountry than day-use recreationalists, had the highest risk of injury with a calculated rate of 1 attack per 241,085 backcountry recreation days.

Counts of the number of female grizzlies that produce litters of cubs are obtained from ground observations, fixed-wing aerial flights, and trail camera photos. Most litters contain 1, 2, or 3 cubs; litters of 4 are rare. Photo by A. Oliver.

Bear Management Technician Eric Reinertson retrieving an adult male grizzly bear's radio collar from the bear's winter den on Flat Mountain. NPS photo – J. Hadley

## Visitor Compliance with Bear Spray and Group Size Bear Safety Recommendations

To reduce the risk of bear attack in the park, safety information distributed to visitors recommends backcountry recreationists traveling on foot maintain group sizes of at least 3 people and carry bear spray. To evaluate visitor compliance with these safety recommendations we conduct annual surveys to determine the proportion of recreationists that follow these recommendations. We also record how many hikers carry other deterrents such a bear bells or firearms.

### *Day Hikers*

Yellowstone National Park contains >1,000 miles of backcountry hiking trails accessible from 92 trailheads located throughout the park. We surveyed 2,195 day-hikers traveling in 698 groups on 28 different trails. The most common group size observed was 2 people per party. Fifty-three percent (371) of day hiking parties had less than the recommended party size of 3 people and 12% (82) hiked by themselves. Of the 2,195 day-hikers, 454 (21%) carried bear spray, 21 (1%) had bear bells, and 2 (<1%) carried firearms. Of the 698 groups of day hikers, 356 (51%) had at least 1 member that carried bear spray, 16 groups (2%) had at least 1 person wearing bear bells, and 1 group (<1%) had at least one person carrying a firearm.

### *Overnight Backpackers*

Yellowstone National Park has 301 designated backcountry campsites. We observed 133 backpackers in 47 groups on 10 different trails. The most common group size observed was 2 people per party. Sixty-six percent (31) of the backpacking groups had less than the recommended party size of 3 people and 17% (8) hiked alone. Of the 133 backpackers, 100 (75%) carried bear spray, 3 (2%) carried firearms, and none had bear bells. Of the 47 groups of backpackers, 43 (92%) had at least 1 person in the party that carried bear spray, 3 groups (6%) had at least 1 person carrying a firearm, and zero groups had anyone carrying bear bells.

Table 3. Risk of park visitors being attacked by grizzly bears and black bears while engaged in different recreational activities in Yellowstone National Park, 1979 – 2019.

| Recreational activity | Risk of injury by grizzly bear | Risk of injury by black bear | Risk of injury by unknown species of bear (grizzly or black bear) | Risk of injury by grizzly and black bear combined |
|---|---|---|---|---|
| **Remain in developed areas, along roadsides, and on boardwalk trails** | 1 injury per 61.5 million recreational visits | 1 injury per 122.9 million recreational visits | No injuries reported | 1 injury per 41.0 million recreational visits |
| **Camp overnight in auto campground** | 1 injury per 27.2 million overnight stays | No injuries reported | No injuries reported | 1 injury per 27.2 million overnight stays |
| **Camp overnight in backcountry campsite** | 1 injury per 1.7 million overnight stays | 1 injury per 850,000 overnight stays | 1 injury per 1.7 million overnight stays | 1 injury per 425,000 overnight stays |
| **Day-use backcountry recreational activity involving foot travel (day hiker, photography, fishing, etc.)** | 1 injury per 339,523 backcountry recreation days | 1 injury per 5,432,370 backcountry recreation days | No injuries reported | 1 injury per 319,551 backcountry recreation days |
| **Backcountry backpacker while hiking (not in campsite)** | 1 injury per 241,873 backcountry recreation days | 1 injury per 1.2 million recreation days | No injuries reported | 1 injury per 241,873 backcountry recreation days |
| **All visitors combined** | 1 injury per 3,322,608 | 1 injury per 24,587,301 | 1 injury per 40,978,835 | 1 injury per 2,731,922 |

Bear Management Biologist Kerry Gunther (left) and Bear Management Technician Justin Mills (right) counting whitebark pine cones on the Deaf Jim Ridge whitebark pine transect. Whitebark pine seeds are a significant source of fat for grizzly and black bears during late summer and fall of years with abundant cone production. NPS photo – E. Loggers

## Use of Bear Spray

Bear spray was deployed in one reported incident in YNP in 2019. On June 11, three fisheries technicians had a surprise encounter with an adult grizzly bear while hiking off-trail in the Red Grass Creek drainage. The bear was approximately 75 yards to the side of the group when first noticed. The bear charged at an angle and the lead person deployed their bear spray hitting the bear in the side and rump as the bear ran toward the second person in line. The second person deployed their bear spray hitting the bear directly in the face. After being hit in the face with bear spray the bear veered off and ran away.

## Bear Consumption of Cutthroat Trout

Yellowstone cutthroat trout (YCT) are a calorie rich food for bears with home ranges near Yellowstone Lake. Non-native lake trout, whirling disease caused by an exotic parasite, and drought have substantially reduced the YCT population in Yellowstone Lake. For these reasons, we monitor cutthroat trout spawning activity in five streams located along the north shore and four streams located in the West Thumb of Yellowstone Lake.

### *North Shore Streams*

In 2019, the ice went off Yellowstone Lake on May 26. In North Shore streams, only 32 spawning YCT were counted. We counted 24 spawning YCT in Bridge Creek, 6 in Hatchery Creek, and 2 in Lodge Creek. We did not observe any spawning YCT in Incinerator Creek or Wells Creek. We did not observe any evidence of bear fishing activity (i.e., observations of bears fishing, fish parts, bear scats containing fish parts) along any of the monitored North Shore streams in 2019.

### *West Thumb Streams*

On West Thumb streams, 174 spawning YCT were counted, including 164 in Little Thumb Creek, 9 in Sandy Creek, and 1 in Sewer Creek. No spawning YCT were observed in stream #1167. A remote camera set up on Little Thumb Creek captured images of 1 grizzly and 1 black bear fishing in the creek. No evidence (i.e., observations of bears fishing, fish parts associated with bear tracks, bear scats containing fish parts) were found on Sandy Creek, Sewer Creek, or stream #1167.

### *Conservation Outlook for Cutthroat Trout*

As part of YCT conservation efforts, park fisheries biologists and contracted netters caught and removed 282,960 non-native lake trout in 2019. Since lake trout suppression efforts began in 1994, 3.4 million lake trout have been removed from Yellowstone Lake through suppression gill netting. In addition, in 2019 fishery biologists began efforts to kill non-native lake trout eggs using soy-gluten pellets. The pellets are scattered by helicopter over lake trout spawning beds. The decomposing pellets use up the dissolved oxygen, thereby killing the eggs. These removal programs have slowed lake trout population growth and likely started to send the population into decline. Juvenile YCT are again recruiting into the population, adult YCT are increasing in some tributaries, and bears are once again preying on YCT in a few tributary streams.

## Bear Consumption of Ungulates

Bison, moose, elk, and deer are concentrated sources of energy consumed by bears through scavenging and predation. Prior to wolf reintroduction, the peak in bear consumption of ungulate meat occurred in late spring when bears scavenged the remains of elk and bison that died of over-winter starvation and malnutrition. The number of ungulate carcasses available during spring was higher following severe winters than after mild or moderate winters. Following wolf reintroduction, the species composition, distribution, and seasonal timing of carcasses consumed by bears changed. The number of bison and mule deer carcasses increased on the northern range whereas the number of elk carcasses declined. In addition, the number of elk overwintering in the Firehole River drainage and Heart Lake thermal areas, and therefore overwinter mortality of these species, declined considerably following wolf reintroduction. To monitor broad-scale trends in grizzly bear consumption of ungulate meat, we record opportunistic sightings of grizzly and black bears feeding on ungulate carcasses throughout YNP. In 2019, we recorded 721 opportunistic sightings of grizzly bears in YNP. In 109 (15%) of these sightings, the observed grizzlies fed on ungulate carcasses. Grizzlies were observed consuming ungulate carcasses from March through December (figure 15); most observations of grizzlies consuming ungulates occurred in May (21) and August (28). Bison (61) and elk (33) were the species of ungulates most often consumed by grizzlies. In contrast, black bears fed on ungulate flesh in only 26 (3%) of 1,053 opportunistic observations. Black bears more often consumed smaller ungulate species including elk (11), mule deer (6), and pronghorn (4). Interference competition from grizzly bears likely inhibits black bear use of carcasses of larger ungulate species. The number of opportunistic observations of grizzly bears feeding on ungulates in 2019 (109), was higher than in 2018 (76) and higher than the long-term average of 76 per year recorded from 1983 to 2019 (figure 16).

## Whitebark Pine Cone Production

Whitebark pine seeds are a rich source of fat for bears during the time-period they are putting on weight for hibernation. Bears whose home ranges include whitebark pine forests preferentially consume whitebark pine seeds during autumn in years when cone production exceeds approximately 13-23 cones per tree. We monitor whitebark pine cone production on 10 transects located throughout the park. Cone production on these transects averaged 6.9 cones per tree in 2019, which was considerably lower than the average of 16.4 cones per tree recorded for the 33-year period 1987-2019 (figure. 17). Cone production was approximately equal to the long-term average on 3 transects and below average on 7 transects.

## Recreational Use of Bear Habitat

Yellowstone National Park encompasses 3,472 square miles in the core of occupied grizzly bear habitat in the Greater Yellowstone Ecosystem. Most (~ 99%) of the habitat in the park is relatively pristine, undeveloped land; 92% of the park has been recommended for wilderness designation, and by National Park Service policy is managed so as not to preclude that designation in the future. Only ~1% of the park's habitat has been significantly altered through construction of roads and developments. Visitors and bears in YNP are managed in three broad zones: developed areas, road corridors, and backcountry/proposed wilderness. Each zone has different strategies for managing the human-bear interface. Human activities are prioritized in developed areas, road corridors are managed for use by both bears and people, and bears are generally given priority in backcountry areas. Total visitation to YNP was 5,207,816 visits in 2019, including recreational and non-recreational use. Recreational visits in 2019 totaled 4,020,288, which is the 5th straight year recreational visits topped the four million mark. Most of the park's recreational visitation occurred during the six-month period from May through October, the same period that all sex and age classes of grizzly bears are out of their winter dens and active on the landscape. In 2019, there were 3,836,763 recreational visits (95%) during those peak months, an average of 20,852 recreational visits per day. Park visitors spent 645,878 overnight stays in roadside campgrounds and 37,827 overnight stays in remote backcountry campsites in YNP. Although total park recreational visitation has increased significantly over time, the number of overnight stays in backcountry areas, the most important bear habitat in the

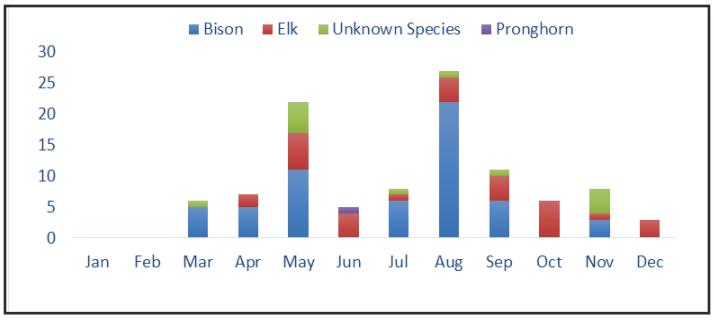


Figure 15. Number of opportunistic observations of grizzly bears consuming ungulate meat by month in Yellowstone National Park, 2019.

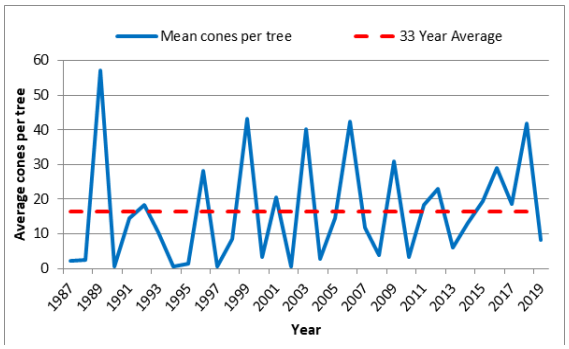


Figure 17. Average number of whitebark pine cones counted per tree on 10 transects located in Yellowtone National Park, 1987-2019.

When available, grizzly bears select ungulate carcasses over most other foods. In 2019, grizzly bears scavenged ungulate carcasses in 109 (15%) of 721 opportunistic grizzly bear sightings recorded in Yellowstone National Park. Due to their larger size and more aggressive behavior than black bears, grizzly bears dominate most carcasses. Black bears fed on carcasses in only 26 of 1,053 (3%) opportunistic black bear sightings. NPS photo.

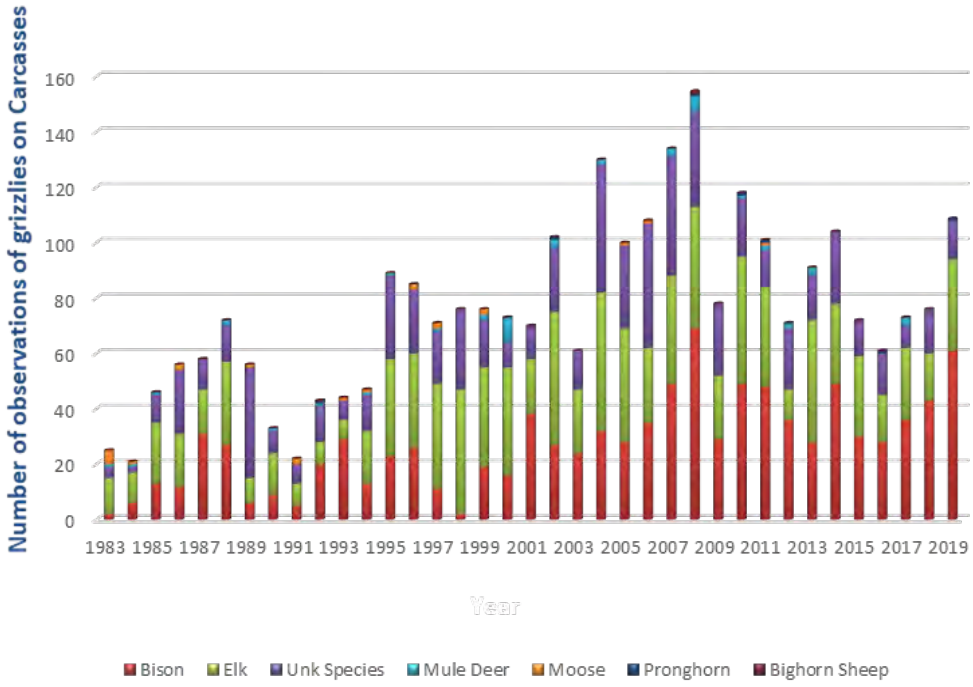


Figure 16. Number of opportunistic observations of grizzly bears consuming different species of ungulate meat by year in Yellowstone National Park, 1983-2019.

A trail camera photo of a grizzly bear cooling off in a small cold pool referred to as the "bear bathtub." Most bear use of the pool occurs during the late summer when daily air temperatures are still hot and bears have already put on a thick layer of fat for the upcoming winter period of hibernation. NPS – trail camera photo.

park, has been relatively stable, ranging from 39,000 to 46,000 overnight stays per year since 1972.

## Bear Thermoregulation Study

Bear populations face potential habitat changes and thermoregulation challenges from warming climatic conditions; therefore, conducting engaging science that informs the public and managers is a pressing and vital conservation need. Natural and artificial water sources can help to mitigate the effects of increasingly high temperatures on bears; however, little is known about how animals use water sources for thermoregulation. Cold-water immersion may allow large-bodied mammals such as bears to maximize foraging efficiency when food is abundant, thus benefitting survival and reproduction, despite ambient temperatures that exceed thermal neutral zones. In 2018, we initiated a remote camera project to examine how grizzly bears and American black bears use a small cold pool referred to as the "bear bathtub" in YNP. Our objectives were to 1) estimate the number of black and grizzly bears using the bathtub for thermoregulation, 2) determine how bathtub use changes over time, and 3) develop science education materials for children.

We deployed two HD video cameras and two still trail cameras in 2018 and four HD video cameras and four still cameras in 2019. Motion-activated remote cameras were set at complementary angles to maximize our ability to identify individual black and grizzly bears (analysis in progress). Video cameras were set to record 3-minute video clips 1 minute apart in 2018 and 3-minute video clips 1 second apart in 2019.

We obtained 165 videos between June 13 and October 9, 2018, and 35 videos between June 19 and October 16, 2019. We detected black bears, grizzly bears, deer, elk, and pine marten at the bathtub. Our earliest black bear detection occurred on July 25 in 2018 and August 12 in 2019; our earliest grizzly bear detection occurred on August 2 in 2018 and August 11 in 2019. Our latest black bear detection occurred on September 20 in 2018 and September 17 in 2019; our latest grizzly bear detection occurred on October 9 in 2018 and September 26 in 2019. We detected 0 black bear and 0 grizzly bear family groups in 2018; we detected 1 black bear family group (1 COY) and 1 grizzly bear family group (1COY) in 2019.

Generally, grizzly bear use was much higher than black bear use in both years and grizzly use was more frequent during summer 2018 than in summer 2019, with most detections in both summers occurring between August 15 and September 15. Concurrent whitebark pine surveys conducted in the park indicated an abundant whitebark pine-cone crop in 2018 and a less abundant crop in 2019. Although we have two more summers of monitoring the bear bathtub, preliminary results suggest grizzly bears dominated the water source and bathtub use was correlated with relative food abundance

(i.e., whitebark pine cone production in the surrounding forest). The information gleaned from YNP's "bear bathtub" was shared with biologists working on a similar project in the Bitterroot Valley, Montana. The cooperative effort led to publication of a children's book designed to inspire today's children to become the next generations scientists. The book will be sold in the Yellowstone Forever bookstores throughout the park.

## Northern Range Black Bear Study

From 2017 to 2018 a cooperative study among YNP, Montana State University, and the Interagency Grizzly Bear Study Team (IGBST) was conducted to determine black bear numbers, density and resource selection on the parks northern range. Non-invasive genetic sampling over a portion of the northern range was used to collect 3,673 bear hair samples from 26 hair snares, 217 bear rub trees, and 53 rub objects such as powerline poles. Laboratory extraction of DNA from the hair samples was completed in 2019 and identified unique genetic markers from 138 black bears (66 male and 72 female) and 35 grizzly bears (21 male and 14 female) in the area sampled. Based on these data, an estimated 204 black bears (95% CI = 150 - 278) live on the northern range within YNP. Black bear densities were highest in Douglas-fir and subalpine fir forest community types. Black bear densities were significantly lower in non-forested vegetation communities dominated by Idaho fescue and big sagebrush. Black bears may be avoiding large non-forested areas due to the lack of escape trees and the threats (interference competition and intra-guild predation) posed by grizzly bears and wolves.

As part of the study, biologists captured and fitted radio collars to 14 black bears (6 males and 8 females). Average minimum convex polygon home range estimates for black bears with >1,000 radio telemetry fixes were 514 $mi^2$ for adult males, 103 $mi^2$ for subadult males, 62 $mi^2$ for adult females, and 48 $mi^2$ for subadult females. Summer home ranges were significantly larger than spring and fall home ranges.

Based on telemetry fixes, in early spring black bears preferentially selected patches of newly emerged grasses and sedges within forested habitats. In the late spring, as phenological development of grasses and sedges progressed, black bears selected riparian areas within forested habitats that contained high vegetation biomass such as cow parsnip. Radio-collared female and subadult black bears preferentially selected habitats near roads, indicating they may be using areas of human activity as a shield against large male black bears and more aggressive grizzly bears and wolves. Dominant male black bears, grizzly bears, and wolves tend to avoid centers of human activity. In spring, black bears in northern Yellowstone did not make directed movements to known elk calving areas to prey on newborn elk, but rather consumed calves encountered opportunistically throughout their home ranges.

Montana State University graduate student Nate Bowersock pulling black bear hair from a scent baited hair snare on the park's northern range. As part of his masters project, Nate is estimating the number of American black bears and their use of habitats on the northern range. NPS photo.

## Bear-proof Food Storage Locker Installation

As part of the park's strategy for preventing bears from obtaining human foods, the park purchased and installed 125 bear-proof food storage lockers in 2019 with donations raised by Yellowstone Forever. The food storage lockers were installed by the Youth Conservation Corps (82 lockers), Bear Management (23 lockers), and Ground-Work USA (20 lockers) staff into roadside campgrounds and backcountry campsites. With the installation of 118 food storage lockers in roadside campgrounds, 943 of the park's 1,907 (49%) front-country campsites now have bear-proof food storage lockers. Seven of the park's 11 campgrounds have a food storage locker in every campsite. It is the park's goal to provide visitors with bear-proof food storage lockers in

Bear Management Technician Elise Loggers retrieving a radio collar from the den of an adult male black bear on the Madison Plateau. Cave dens are somewhat uncommon, most bears dig their dens under the root systems of standing trees or into the sides of hills. NPS photo – J. Mills.

every campground campsite in the park. Bear Management staff also installed seven food storage lockers in backcountry campsites to replace broken food hanging poles. All 301 designated backcountry campsites in YNP currently have a food storage device (food hanging pole in 266 campsites, food storage locker in 35 campsites). Food storage lockers and food hanging poles provide an easy and convenient method of storing food in a bear-proof manner, thereby reducing the potential for bear-human conflicts in the park. By reducing the frequency of bear-human conflicts, bear-proof food storage devices minimize the number of bears that are captured and killed to protect the lives and property of park visitors.

## Vehicle Strike Mortality of Wildlife

In 2019, 70 large mammals (≥30 pounds) were struck and killed by vehicles on park roads (figure 18). Mule deer (20), bison (19), and elk (12) were the species most often killed in collisions with vehicles. Other species hit and killed by vehicles on park roads included pronghorn (8), coyote (3), black bear (2), wolf (2), bighorn sheep (1), mountain lion (1), river otter (1), and white-tailed deer (1). The roads that had the largest number of vehicle strike mortalities were Tower to Northeast Entrance (16), Mammoth to Tower (9), and Highway #191 (9). The number of road-killed large mammals in 2019 was lower than the 31-year average recorded from 1989 to 2019 (figure 19).

## Wildlife Carcass Management

To protect visitors and scavengers, large mammals that die from old age, disease, vehicle strike, or other causes in developments, along roads and trails, and near campsites are moved so they don't attract grizzly bears, black bears, wolves, or other scavengers to areas of concentrated visitor use. In 2019, YNP staff removed 101 large mammal carcasses from visitor use areas. Carcasses removed included 28 bison, 27 elk, 25 mule deer, 8 pronghorn, 4 bighorn sheep, 3 wolves, 2 black bears, 2 mountain lions, 1 white-tailed deer, and 1 coyote.

## Conclusion

YNP experienced over 4 million visits in 2019, the 5th straight year visitation surpassed the 4 million mark. However, because of significant resources dedicated to managing the human-bear interface, there were few conflicts between visitors and bears and no grizzly bears were killed in management actions. YNP's bear management philosophy of preventing bears from obtaining human foods and garbage as the primary method for reducing bear-human conflicts and human-caused bear mortalities, first implemented in the 1970s, continues to be highly successful today. YNP 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. The low numbers of human-caused grizzly bear mortalities inside YNP combined with the parks' cub production are contributing significantly toward grizzly bear recovery in the Greater Yellowstone Ecosystem.

The viewing of bears foraging in roadside meadows continued to be very popular with park visitors and wildlife tour operators in 2019 and contributed significantly to the economies of park gateway communities and the surrounding states. YNP has become the primary grizzly bear viewing destination in the lower 48 states. The most formidable challenge for managing roadside bear viewing in YNP is not managing the bears, but sustaining and expanding as necessary the people management programs that have made bear management successful to date.

Grizzly bears are the icon of wildness in Yellowstone National Park. The National Park Service's willingness to sustain a species that has such a formidable reputation in a park with such high visitation is a remarkable conservation achievement.

## Graduate Student Projects

During 2019, the following graduate students assisted the YNP Bear Management Program with research projects.

### Graduate Student: Nate Bowersock

*(Master of Science)*

**Project Title:** Spatiotemporal Patterns of Resource Use and Density of American Black Bears on Yellowstone's Northern Range

**Committee Chair:** Andrea Litt, Department of Ecology, Montana State University

**Graduate Committee Members:** Jay Rottella (MSU), Frank van Manen (IGBST), Kerry Gunther (YNP)

**Current Status:** Field work, laboratory DNA extraction, and data analysis completed; Thesis chapters and scientific publications writing ongoing

### Graduate Student: Elise Loggers

*(Master of Science)*

**Project Title:** Resource Selection of Grizzly Bears and Evaluation of Yellowstone's Bear Management Areas

**Committee Chair:** Andrea Litt, Department of Ecology, Montana State University

**Graduate Committee Members:** Jay Rottella (MSU), Frank van Manen (IGBST), Kerry Gunther (YNP)

**Current Status:** Field work and data analysis ongoing

## Publications


Figure 18. Locations of vehicle strike wildlife mortality in Yellowstone National Park, 2019.

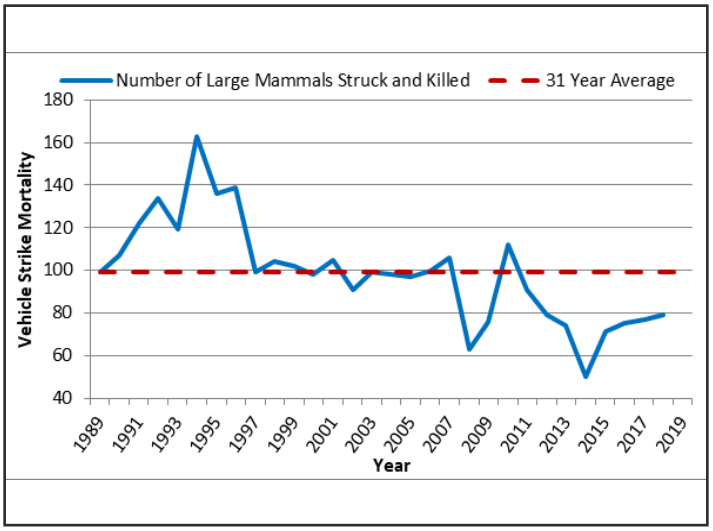


Figure 19. Number of large mammals struck and killed by vehicles in YNP, 1989-2019.

Koel, T.M., L.M. Tronstad, J.L. Arnold, K.A. Gunther, D.W. Smith, J.M. Syslo, and P.J. White. 2019. Predatory fish invasion induces within and across ecosystem effects in Yellowstone National Park. Science Advances, eaav1139(2019).

## Acknowledgement of Volunteer Work

Eleven dedicated volunteers provided 1,159 hours of field assistance to Bear Management Office staff working on research, monitoring, and management activities in 2019. The success of YNP's 2019 Bear Management Program would not have been possible without these dedicated individuals.

Bear Management Technician Jessica Hadley (left) and Bear Management Volunteer Oscar Dalling (right) in the Yellowstone River delta retrieving the radio collar of an adult male grizzly bear. NPS photo – E. Reinertson

## 2019 Bear Project Volunteers

| Name | Hours |
|---|---|
| Oscar Dalling | 519 |
| Bruce Kassebaum | 320 |
| Noe Sitbon Taylor | 200 |
| Thi Pruitt | 50 |
| Kyle Vanderstoep | 15 |
| Chloe Heinzel | 14 |
| Emily Sawey | 14 |
| Irina Ramalli | 10 |
| Sam Walker | 8 |
| Ellie Reinertson | 5 |
| Lauren McGarvey | 4 |
| Total | 1,159 |

(BACK COVER) An adult grizzly bear foraging for food after an October snowstorm. NPS photo - J. Hadley

For a complete list of our publications, please visit: go.nps.gov/yellbears

Suggested citation: K. A. Gunther, T.C. Wyman, E.G. Reinertson, A.M. Bramblett, N. Bowersock, B. Dunne, J. Hadley, E. Loggers, J. Mills, M. Sawaya, D. Schneider, and O. Dalling. 2020. Yellowstone National Park Bear Management Program Annual Report 2019. National Park Service, Yellowstone Center for Resources, Wildlife and Aquatic Resources Branch, Bear Management Office, Yellowstone National Park, Wyoming, USA. YCR-2020-03.