National Park Service
U.S. Department of the Interior

Denali National Park and Preserve

2017 Annual Wolf Report









Denali National Park and Preserve

All photos courtesy of National Park Service, unless otherwise indicated.

On The Cover (clockwise from top left): A wolf peers into the willows.
A National Park Service Biologist uses a scope to spot wildlife. Visitors get a unique opportunity to see a wolf along the Denali Park Road. A gray wolf in Denali National Park.
View of Denali National Park.

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NPS Photo / Emily Mesner



National Geographic



NPS Photo

Background

Wolves are one of six keystone large mammal species in interior Alaska, along with grizzly bears, black bears, moose, caribou, and Dall sheep. Wolves are important to people and to the ecosystem as a whole. As a top predator, wolves may play a key role in influencing ungulate populations, such as caribou. This may also influence vegetation patterns and promote species diversity .

Wolves are found in all three parks of the Central Alaska Monitoring Network (CAKN): Denali National Park and Preserve (DENA), Yukon-Charley Rivers National Preserve, and Wrangell-St. Elias National Park and Preserve. Indeed, wolves are specifically identified in the enabling legislation and management objectives of all three CAKN parks.

This report summarizes efforts to monitor wolves in Denali National Park and Preserve (Denali), Alaska, through December 2017. The main goal of monitoring is to track how many wolves there are and where they're moving. However, a variety of additional data is obtained in the monitoring process. This information can help future wildlife management and research, and can also help develop scientific models of predator/prey systems.

For example, scientists use data obtained from wolf monitoring to help protect wolf dens as part of the Denali Wolf-Human Conflict Management Plan. In heavily visited portions of the park, managers want to know where active wolf dens and rendezvous sites (pup rearing areas) are so that they can be protected from disturbance.

Additionally, data on the genetic, physical, and immunological characteristics of wolves, obtained in the course of wolf capture, will be important in evaluating long-term changes in wolf populations in Alaska.

Information gathered through wolf monitoring can also help scientists determine whether the park packs are being impacted by activities happening outside of the parks, such as intensive wolf harvest or wolf control.



NPS Photo

Wolves are important to people in Alaska. Some value the opportunity to hunt or trap wolves while others value their existence or the opportunity to see a wolf. Wolves are of great significance to Denali's visitors because of the exceptional opportunities to view wolves in Denali. The unique long-tenured research project in Denali allows scientists around the world to understand how wolves live in a relatively intact ecosystem, and will be invaluable for years to come.

Park-wide monitoring of wolves in Denali was initiated by Resource Management Ranger John Dalle -Molle in 1986, with principal investigators L. David Mech and Layne Adams. Field work and project management from 1986 to 2016 was conducted by Dr. Layne Adams, Dr. Steve Arthur, Dr. Bridget Borg, John Burch, and Tom Meier. In 2017, Dr. Bridget Borg oversaw the program, and field work and program support was conducted by Kaija Klauder, Erica Goad and Lindsey Taylor.

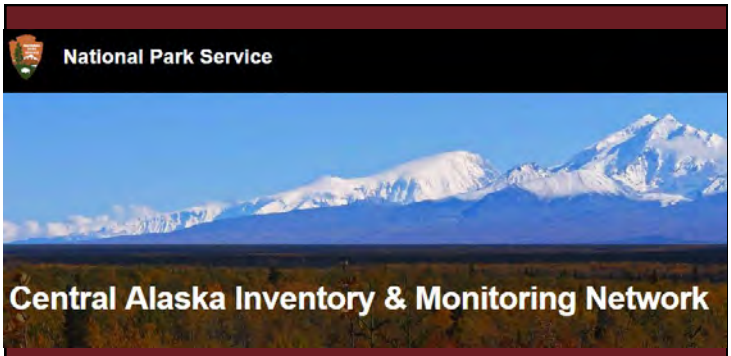
Wolf Project Goals

Wolf management in Denali isn't just about Denali — the National Park Service looks at the big picture when it comes to data collection. Parks across the country are grouped into Inventory and Monitoring Networks, and all the parks in a network work together to accomplish long term research and monitoring goals. One key element of this process is that all the parks make sure to collect specific types of data the same way, so that it is comparable across parks. Alaska is part of the Central Alaskan Network (CAKN), along with Wrangell-St. Elias National Park and Preserve, and Yukon-Charley Rivers National Preserve. The following are some of the measurable objectives for wolf monitoring programs across CAKN (Meier et al. 2009, see sidebar).

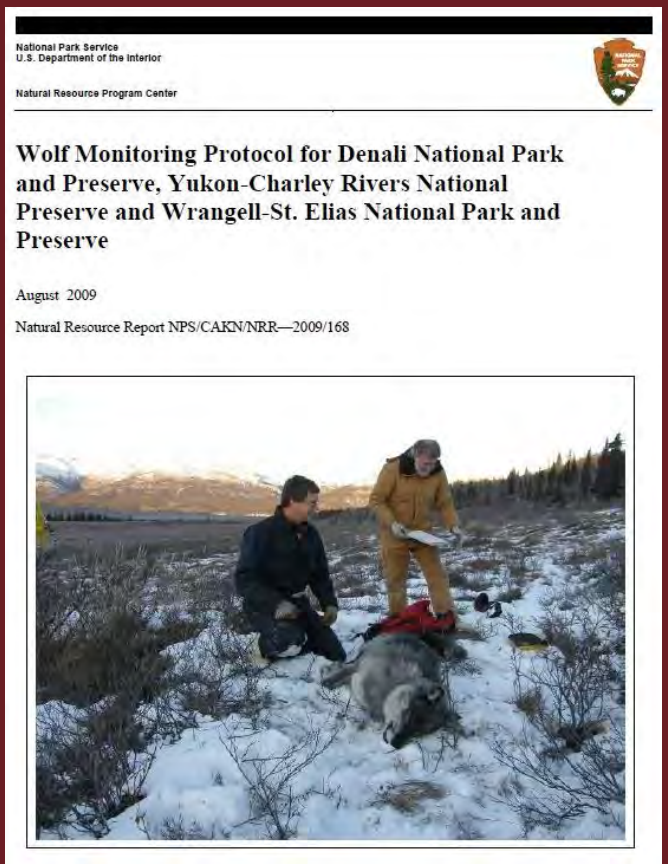
- Capture and radio-collar 1-3 individuals in each wolf pack identified in the study area.
- Determine the demography (numbers, colors, age structure) of monitored wolf packs.
- Obtain genetic samples from captured wolves.
- Determine pack size for each collared pack in fall (early winter) and spring (late winter).
- Detect pack extinction and pack formation events in the population.
- Locate non-radio-collared wolf packs on Park and Preserve lands using aerial snow tracking.
- Detect changes in wolf density, pack size, and home range size over time.
- Monitor and detect changes in the physical, immunological, and genetic makeup of the wolf population over time.

These two goals are specific to DENAi:

- Investigate the effects of wildlife management activities on the natural and healthy character of wolves in DENA.
- Investigate the biological and social characteristics of wolf viewing by visitors in DENA, and factors that may affect wolf viewing opportunities.



The 2009 wolf monitoring protocol, one of the first protocols approved for the Central Alaska Network's Inventory and Monitoring Program, identifies the long term monitoring objectives for Denali's Wolf Project . It also lays out the procedures that parks should use to collect the data.


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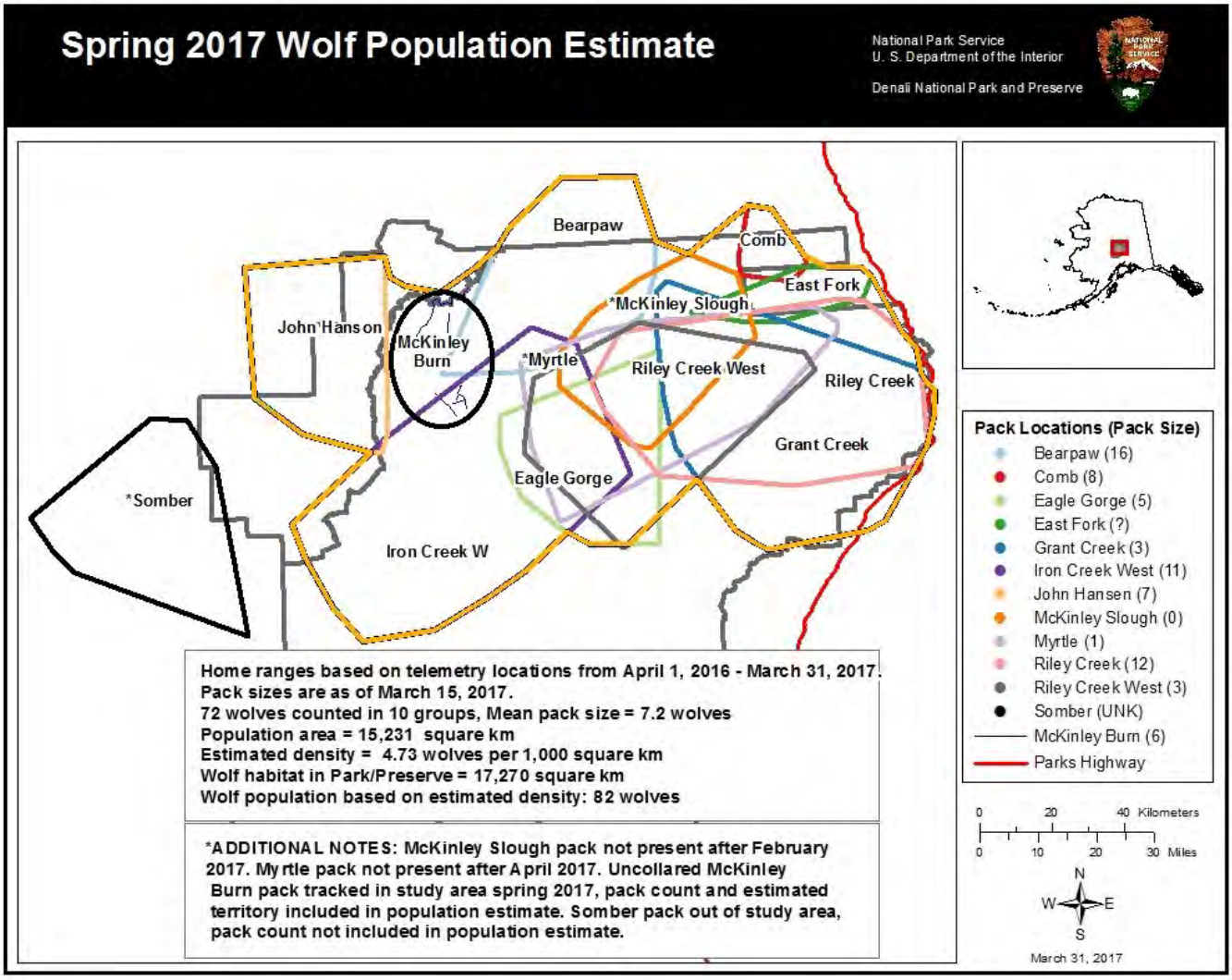
Natural Resource Program Center

Wolf Monitoring Protocol for Denali National Park and Preserve, Yukon-Charley Rivers National Preserve and Wrangell-St. Elias National Park and Preserve

August 2009

Natural Resource Report NPS/CAKN/NRR—2009/168

2017 Summary



In 2017, 10 wolf packs were monitored in the Denali study area and 64 aerial tracking flights were flown to observe wolf pack locations, obtain pack counts, locate den sites, and provide estimates of pups produced. Information from these flights also documented wolves feeding at 12 caribou carcasses, 11 moose carcasses and 1 sheep carcass. In 2017, we captured and collared 10 wolves, including 3 recaptures of wolves collared in previous years to replace aging or failed collars. We collared 3 wolves in a previously un-collared pack, the Comb pack, located in the northeast corner of the park. The spring population estimate for the entire study area was 82 wolves. Four packs denned in 2017, and recruited an estimated 20 pups to the population. Three collared wolves died in 2017. The fall population estimate was 85 wolves.

Wolf viewing was much higher in 2017 than in recent years due to the Riley Creek Pack denning on the Teklanika River not far from the road, as well as the activities of the Riley Creek West pack in passes west of Toklat.

In addition to addressing our long-term monitoring goals, the Denali Wolf Project worked with regional, national, and international collaborators on four research projects.

Reproduction and Mortality

2017

	Reproduction		Mortality		
PACK	**Denned**	**Fall Pup**	**Natural**	**Human-**	**Description**
Eastern Region					
Grant Creek	No				
Riley Creek	Yes	6			
Comb	No				
Myrtle	No		1		starved
McKinley Slough	No		1		abdominal puncture
Western Region					
Bearpaw	Yes	6			
Eagle Gorge	Yes	3			
Iron Creek West	No		1*		killed by wolves
John Hansen	Yes	5			
Riley Creek West	No				
Out of Study Area					
Somber	Suspected				
TOTALS		**20**	**3**		

*Pregnant with four pups (2 male, 2 female) at time of death



Two members of the Riley Creek pack at a buried kill. *NPS Photo*

MYSTERY WOLF

One wolf had puzzled biologists for the past few years. After the wolf's death in 2017, we learned something quite unexpected.



In 2013, the McKinley Slough pack consisted of five wolves, including one radio-collared female, 1211GF. In March 2013, John Burch and Bridget Borg, along with helicopter pilot Troy Cambier, located the McKinley Slough pack on Chitsia Mountain. There was one wolf in the pack that was obviously larger than the others. After evading us in willows and trees for some time, we eventually were able to dart and collar the wolf (right), which was given the identity 1306. 1306 was in excellent condition, weighing 116 lbs. and estimated to be 3 years old. However, assessing the gender of this animal was difficult, as 1306 had no external testes, and a penis that appeared to be malformed.

1211GF died the following year, in January 2014, of natural causes. In March 2014, 1402GF, a gray female, was collared in the McKinley Slough pack, which by then only numbered four wolves. By fall 2014, the McKinley Slough pack was just a pair, with only 1402GF and 1306 remaining. The pair stayed together for the next two years but never denned or produced pups. We suspected that the lack of reproduction might be due to the unusual anatomy of 1306.

Beginning in late January 2017, the McKinley Slough female 1402GF apparently joined the Grant Creek pack, leaving 1306 to scavenge on old kills alone. On February 5, 1306 was seen in trees feeding on an old kill while the Riley Creek West pair rested on a ridge approximately 400 yards away. The Riley Creek West pair got up and ran downhill to the site and chased off 1306 then returned and started feeding. Based on the GPS data, 1306 was dead approximately 11 days later.

1306's carcass was recovered in late March and a necropsy was performed at the ADF&G lab in Fairbanks. The wolf died of starvation following an internal infection caused by a penetrating wound to the abdomen. It did not appear that the initial injury was from other wolves. The necropsy was also a chance to further investigate the sex of 1306.

Upon necropsy, it was revealed that 1306 was a true hermaphrodite. This wolf had ambiguous external genitalia, a non-functional uterus, and two ovatestes —testicular tissue with a small area of tissue that appeared ovary-like. Although true hermaphrodites are known to occur in at least 20 dog breeds, this is the first case we know of a true hermaphrodite in a wild wolf population.

Pack Narratives

EASTERN PACKS

Comb

Pack Counts: Spring – 8 | Fall – 5
Collared Wolves: 1702BM, 1705GM, 1706GF

In March 2017, we found a pack of 8 uncollared wolves in the "outer-outer range" north of the Stampede corridor. In April we were able to put collars on 3 members of the pack: 1702BM, 1705GM and 1706GF. The Comb pack did not den or produce pups in summer 2017 and the fall count for the pack was 5 wolves- 2 gray (both collared) and 3 blacks. The pack traveled on both Park and State lands.

East Fork

Pack Counts: Spring – 0 | Fall – 0
Collared Wolves:

Tracks of 2 to 3 wolves had been seen repeatedly in the former East Fork pack territory and three black uncollared wolves were seen on 11/18/2016, in former East Fork pack territory. Unfortunately, we were not able to locate or collar those wolves in spring of 2017. It is possible that they are members of the former East Fork pack. In May of 2017, there was some evidence that the den site used last year was in use again, although no wolves were seen at or near the site during multiple checks in summer 2017.

Eagle Gorge

Pack Counts: Spring – 5 | Fall – 8
Collared Wolves: 1506GM, 1604GF

In February and March 2017, as the Myrtle pack weakened, Eagle Gorge made forays northward into Myrtle territory before denning in their traditional territory, where they produced 3 pups. The fall 2017 pack count was 8 wolves, which was up from 5 wolves in spring 2017. 1506GM was traveling alone beginning in late August 2017 and left Eagle Gorge territory in late November.

HOW TO NAME A COLLARED WOLF:

1. Last two digits of the year
2. The order of wolves collared that year
3. One letter for the color of the wolf (G = gray, B = black)
4. One letter for the sex of the wolf (F = female, M = male)

How would you name this wolf? A gray female that was the 7th wolf collared in 2017.



Eagle Gorge breeding pair and their three pups, as seen from the air. *NPS Photo / Erica Goad*



NPS Photo / Neil Blake

Grant Creek

Pack Counts: Spring – 3 | Fall – 5
Collared Wolves: 1402GF, 1501GM

An apparent social break up of the Grant Creek pack occurred after several skirmishes with the Riley Creek pack in December 2016. By early January 2017 the Grant Creek male was seen with 1402GF, a former member of the McKinley Slough pack, traveling in McKinley Slough territory. The pair were called Grant Creek. In early summer, they frequented an area along the East Fork River north of the outer range. We suspected that they were denning in the area. However in subsequent observations they did not revisit the area and were never seen with pups. The fall count for the pack was 5. The origin of the additional adults is unknown; it's possible they may have been previous members of the Grant Creek Pack.



A Riley Creek wolf walks along the Park Road in 2017.

NPS Photo/ Kai Schafer

Riley Creek

Pack Counts: Spring – 12 | Fall – 17
Collared Wolves: 1202BF, 1406BM

After a significant expansion of their territory in winter 2016-2017, in summer 2017, the Riley Creek pack denned along the Teklanika River at a den site once used for over 13 consecutive years by the East Fork pack. This was the natal den site for 1202BF, and is perhaps why she chose to use it. The pack had 5 or 6 pups and the pack count went up from 12 in spring 2017 to 17 in fall 2017. The Riley Creek pack was seen frequently along the park road in summer 2017, often using the road corridor for travel to and from their den site.



A black wolf going gray with age. *NPS Photo*

Riley Creek West

Pack Counts: Spring – 3| Fall – 2
Collared Wolves: 1601GM, 1701GF

In February 2017, we collared a companion of 1601GM, 1701GF. This was lucky, because 1601GM's collar failed in July. During summer 2017 there were a total of 3 wolves in the Riley Creek West Pack, the 2 collared wolves and 1 other suspected female wolf. There was no evidence that the Riley Creek West Pack denned or produced pups in 2017. Throughout the winter of 2017-2018 only 1601GM and 1701GF were seen together.

WESTERN PACKS

Bearpaw

Pack Counts: Spring – 16 | Fall – 17
Collared Wolves: 1006BF, 1502GM, 1606GM

The first time the pilot saw the Bearpaw pack in 2017 this was the scene: "Feeding on old remains of TWO bull moose. Racks both tipped up on nose, antlers stood up. One about 50 inches [wide], one about 60 inches, about 6 feet apart. Perhaps a locked set broke apart by the wolves?" The Bearpaw pack numbered 16 wolves in spring 2017 and produced 6 pups (4 gray, 2 black) in summer 2017.

Iron Creek West

Pack Counts: Spring – 11 | Fall – 2
Collared Wolves: 1405GM, 1703GF, 1704GF

The Iron Creek West pack numbered 11 in spring 2017. We collared 2 females in the pack in April 2017: 1703GF and 1704GF. In late April and early May 2017, the Iron Creek West pack made a foray from their traditional territory across the park and north of the outer range. On the way, during an apparent encounter with the Riley Creek pack about a mile from the Riley Creek den site, 1703GF was killed. A necropsy revealed that she was pregnant with 4 pups at the time of her death.

The remaining pack members continued on their foray to the east before returning west. The remaining collared female (1704GF) was located near a den site between Slippery Creek and the Muddy River, however there were no observations of pups or confirmation of denning. In late August, 1704GF was consistently alone and traveled far east and north of her former territory beginning in late November. The breeding male of the Iron Creek West pack, 1405LGM, went on a long journey as well. When he was recollared in February



The "Great White Wolf" was larger than the biologist that darted and sedated him during collaring operations in February 2017.

NPS Photo

2017, he weighed 125 lbs, one of the largest wolves captured in Denali. His former light gray coat had turned mostly white. Although we suspect that he was the breeding male of the Iron Creek West pack in previous years, the death of his suspected mate 1703GF in April 2017 may have led to his departure from the pack. He was traveling alone by mid-July 2017 and left his former territory in October. He made his way south to Broad Pass, then crossed the Denali Highway, traversed south to the Richardson Highway near Hogan Hill, crossed the Richardson, and stayed north of the Glenn Highway to Mentasta Pass. By late December, he appeared to have new territory near the Alaska Highway and Dot Lake around "Knob Ridge." He was trapped in mid-January by a trapper out of Delta Junction. The trapper wrote up the story of "The Great White Wolf" in the Alaska Trappers Magazine. The remaining members of the Iron Creek West pack numbered 2 in the fall of 2017.

John Hansen

Pack Counts: Spring – 7 | Fall – 15
Collared Wolves: 1302GM, 1605GM, 1707BF

In April 2017, the breeding female of the John Hansen pack was collared — 1707BF. The pack denned along the Foraker River and produced at least 5 pups (1 black, 4 gray) in 2017. However, it is possible that there was a second litter as the pack count was up from 7 in spring 2017 to 17 in fall 2017. In August, pilot Dennis Miller got photos of wolves in this pack chasing a moose in deep water (below and right).



McKinley Slough

Pack Counts: Spring – 0 | Fall – NA
Collared Wolves: 1306GM

Beginning in late January, the McKinley Slough female 1402GF was seen joining in with the Grant Creek pack. While 1402GF was seen near a kill site with the Grant Creek pack (1501GM and 3 others) on January 22, 1306GM was over 9 miles away. In early February 2017, 1306 was seen alone, scavenging on old kills. Based on the GPS data, 1306 died in mid-February, at an estimated 7 years of age. 1306's carcass was recovered in late March and a necropsy was performed at ADF&G lab in Fairbanks. It revealed that 1306 died of starvation, following in internal infection caused by a penetrating wound to the abdomen. It did not appear that the initial injury was from other wolves. See the feature on page 9 for more information on the unique mystery of 1306.

Myrtle

Pack Counts: Spring – 1 | Fall – 0
Collared Wolves: 1503GM

Mid-December 2016 was the last time 1504GF and 1503BM were seen together. Following that, both collared wolves made long-ranging movements. 1504GF ended up outside of the park on the north boundary and was presumably trapped or shot. 1503BM traveled east, stopping by the Murie den site on the East Fork River, then went as far as the Savage River before returning west. He eventually died of starvation in mid April while scavenging on a very old carcass. There are no known remaining members of the Myrtle pack.



WOLF-HUMAN INTERACTIONS: WHAT IS THIS WOLF COMMUNICATING?

Interactions between wolves and humans are extremely rare. However, if you do see a wolf, it is helpful to understand their behavior when determining how you should respond.



NEUTRAL

A wolf that has its ears slightly forward or slightly back, is walking or trotting, and may only glance in your direction is neutral about your presence. Enjoy the lucky sighting and do not try to attract its attention.



CURIOUS



A wolf that fixes its gaze on you with its ears pricked might be curious about you. It may approach you slowly or walk around you to get a better look at you. Curious behavior usually results in the wolf leaving once it realizes that you are a human.



HOWLING

Wolves howl to communicate with pack members, often as a chorus. Wolves will howl before a hunt or to communicate with pups. Howls may also be used as a warning to other wolves to stay away.



(c) Bio Expedition

PREDATORY / AGGRESSIVE

When a wolf has its eyes fixed on you, ears forward, is standing tall, and has its tail up, it is acting aggressive or dominant. A predatory wolf will often rush at its prey with little stalking behavior.





Mech and Boitani 2003 and Coren 2001



wolf.org

FEAR / DEFENSIVE

A wolf with ears pinned back and down, hackles raised, crouching, and tail between its legs is acting out of fear or defense. The bigger the threat, the more defensive a wolf will be.





Mech and Boitani 2003 and Coren 2001

WHAT SHOULD I DO IF A WOLF APPROACHES ME?



Wolves are wild animals! Stay at least 25 yards away from wolves at all times. Never feed a wolf. **If a wolf approaches you, DO NOT RUN! Get tough!** To get it to leave:

- Shout aggressively
- Maintain eye contact
- Throw rocks



FOR MORE INFORMATION ON WOLVES IN DENALI, VISIT:
HTTPS://WWW.NPS.GOV/DENA/LEARN/NATURE/WOLVES.HTM

Wolf Management

COLLARING

Denali has been collaring members of the wolf population since 1986 in order to track movements, estimate territory locations and sizes and estimate the population size and density. Current methods of wolf monitoring used in Denali follow the Wolf Monitoring Protocol for Denali National Park and Preserve, Yukon-Charley Rivers National Preserve and Wrangell-St. Elias National Park and Preserve, Alaska (Meier et al. 2009). In brief, this method involves capture and radio-collaring of one or two members of each wolf pack in the study area and locating and counting wolves during aerial tracking flights periodically through the year. Morphological data, including sex, weight, age and color, and blood and tissue samples for genetics and disease analysis, are gathered from captured wolves.

In 2017, eight new wolves were collared, including wolves from the East Fork, Grant Creek, Myrtle, Riley Creek, Bearpaw, Eagle Gorge, and John Hansen packs. Two wolves were recollared: a female in the McKinley Slough pack and a female in the Bearpaw pack.



NPS Photo / Robert Valarcher

WOLF MANAGEMENT AT THE BOUNDARIES

Background

When wildlife cross in and out of the boundaries of protected areas, complex and sometimes controversial management dilemmas can occur. The area known as the Stampede Corridor, which is a notch of state and private land in the northeast corner of Denali, has generated several such difficult situations over the years. One of the most longstanding is the issue of hunting and trapping wolves which spend most of their time inside the Park. Several new developments regarding the management of wildlife in this area occurred in 2017.

Bear Baiting

A recent change in hunting regulations allowed for the taking of brown bears at bait stations. In addition, the wolf hunting season was extended to May 31. Together, this has exposed wolves that are attracted to bait stations to increased and unforeseen harvest pressure in the

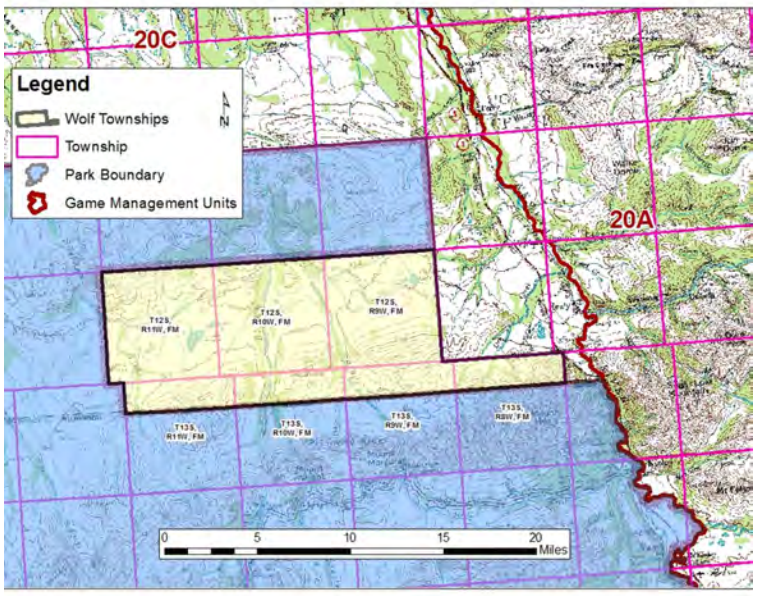


Figure 1. Area newly closed to wolf hunting on April 15, beginning in 2017, to avoid overlap with bear baiting season

Stampede corridor within Game Management Unit 20C. The National Park Service submitted an agenda change request in 2016 to request that the Board of Game to consider closing the wolf hunting season during the overlap with the bear baiting season. The proposal was approved by the Alaska Board of Game and beginning in 2017, the wolf hunting and trapping season in the Stampede Corridor now closes on April 15.

Wolf Harvest and Wolf Sightings

Analysis of 12 years of data from GPS-radio collared wolves shows that the same wolf packs that provide the majority of wolf sightings during the visitor season show a seasonal shift in habitat use, increasing their use of areas just outside of the boundary of the park during the winter and spring (Figure 3). Wolves that frequent the Park Road are accustomed to the presence of humans and may be particularly vulnerable to harvest, with even older breeding wolves susceptible to being trapped or shot.

We found that the probability for wolf sighting during the period a buffer was in place (2000-2010, Figure 2) was twice that of the periods when the buffer was absent (See page 20 for more information on this study). While wolf harvest just outside the northeastern boundary of the park may have little effect on regional scale wolf populations, it can have significant effects on wolf packs whose territories intersect the Park Road, and thus on the experience of Denali's visitors.

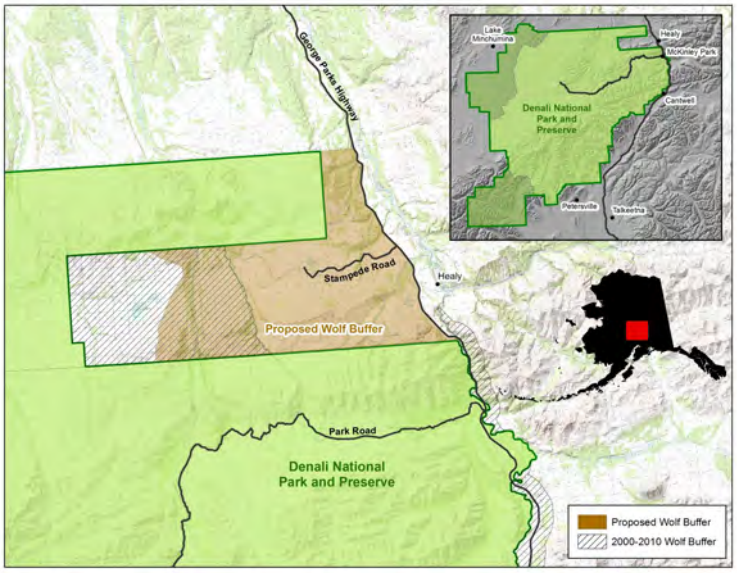


Figure 2. The 2000-2010 harvest buffer (diagonal lines) and 2017 proposed buffer (brown), with Denali Park shown in green.

At the March 2017 Board of Game Meeting, Denali National Park submitted a proposal to the Alaska State Board of Game to close areas adjacent to Denali National Park to wolf hunting and trapping, based on our research. The Board of Game rejected the proposal at their March 2017 meeting.

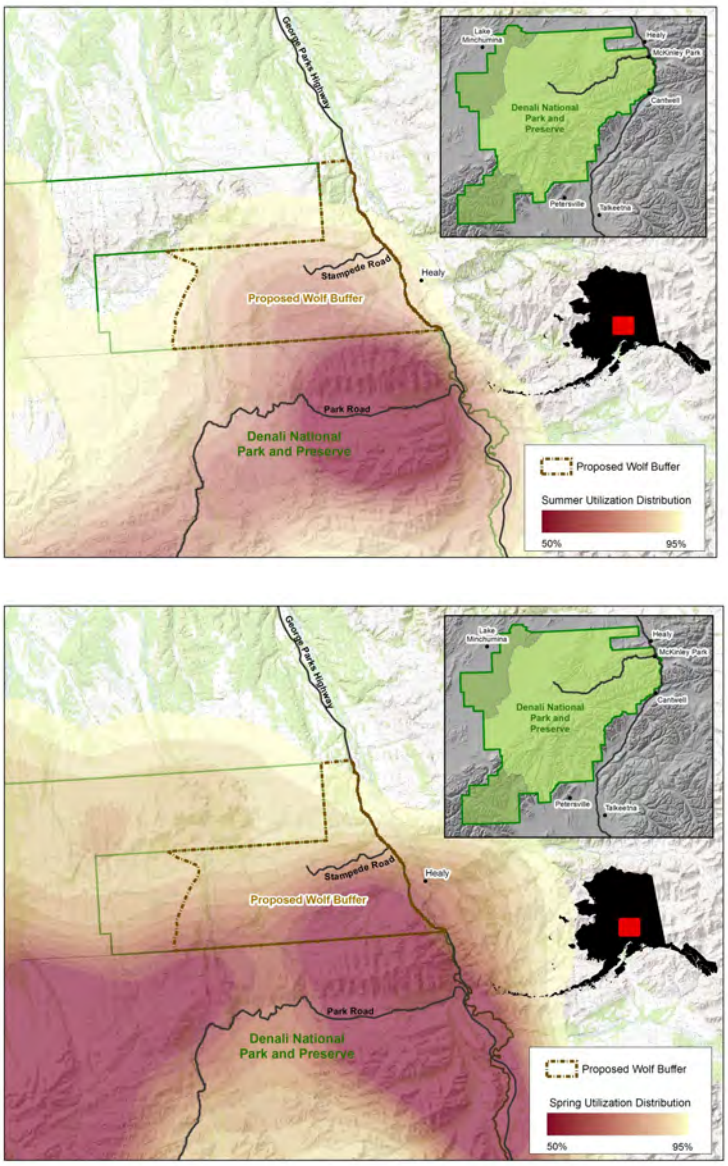


Figure 3. GPS collar data from the last 12 years show summer and winter use patterns of wolves from the packs that provide the majority of wolf sightings in the park. The upper image shows the summer use pattern — note how high use areas (shown in darker red) are concentrated along the Park Road, with some infrequent use of areas outside of the park. The lower map shows use patterns for the same wolves during the spring months — February, March, April, which correspond to the pre-breeding and breeding period. Note how wolves shift their use into areas just north of the park boundaries, making them more susceptible to trapping and hunting during these key periods.

CLOSURES

Four closures around den sites were put in place in 2017 following Denali's Wolf Human Management Plan.

Sanctuary Wolf Closure

The Sanctuary Wolf Closure was implemented on April 17, 2017 as per policy to close wolf denning areas used in the last two years until denning activity for the current year is determined. Wolves last denned in this location in 2016. The area closed encompasses the north portion of backcountry unit #5, bounded to the south by a line approximately 6.5 miles upstream of Sanctuary Campground. After it was confirmed that no wolves denned in this location in 2017, the closure was opened on June 15, 2017.

Teklanika Wolf Closure

The Teklanika Wolf Closure was implemented on May 16, 2017. Denning activity had been observed in the area at the time of closure. The area closed encompassed areas south of the Teklanika bridge and along Igloo Creek. The Riley Creek pack was confirmed



NPS Photo / Kent Miller



NPS Photo

to be denning in this location. The closure was lifted on September 25, 2017, once it was confirmed that the wolves were no longer using the den site.

7 Mile Wolf Closure

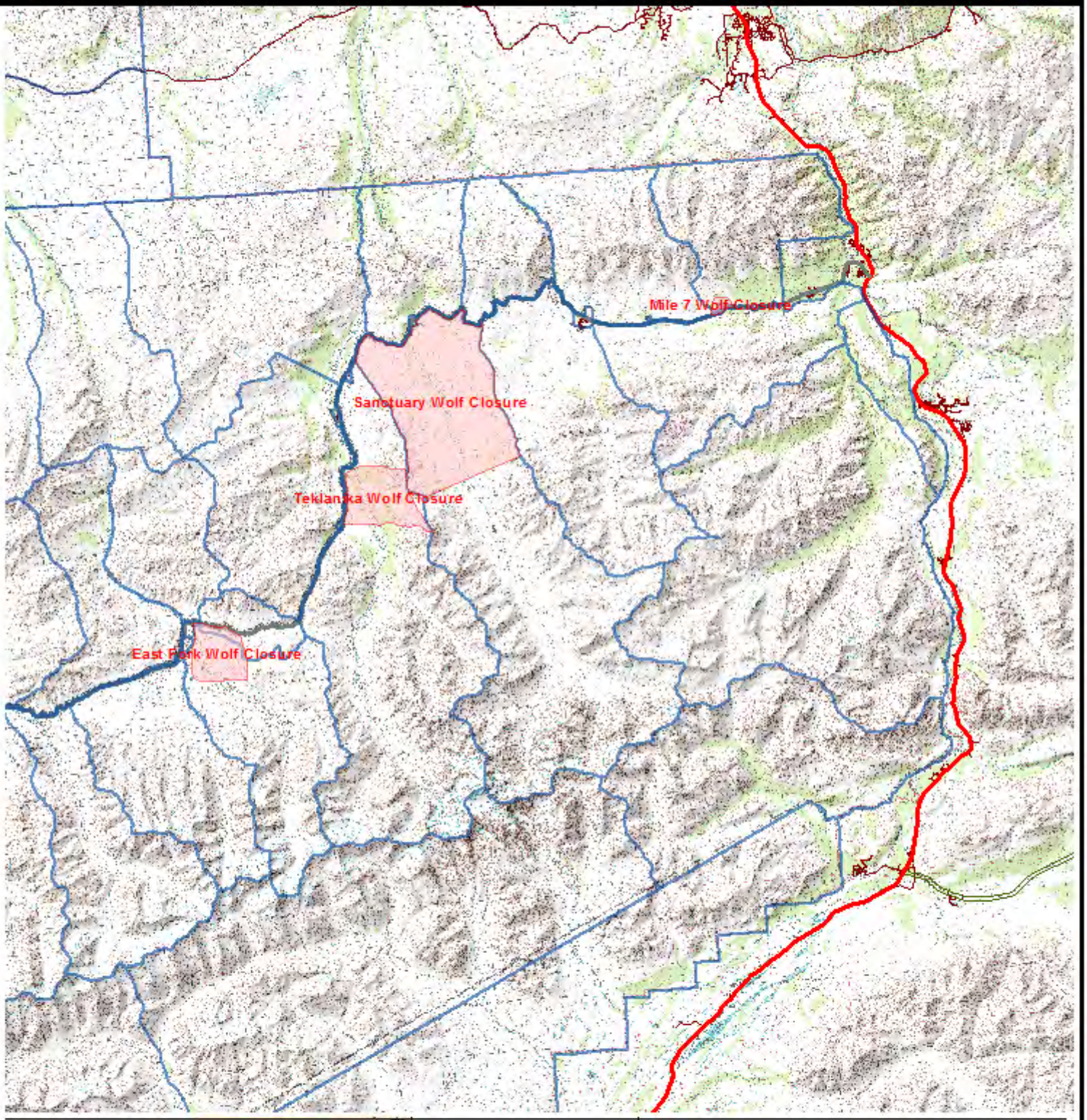
The 7 Mile Wolf Closure was implemented on April 17, 2017 as per policy to close wolf denning areas used in the last two years until denning activity for the current year is determined. Wolves last denned in this location in 2015. The closure encompassed an area with approximately a ½ mile radius around the 7 Mile Pit. After it was confirmed that no wolves denned in this location in 2017, the closure was opened on June 7, 2017.

East Fork Wolf Closure

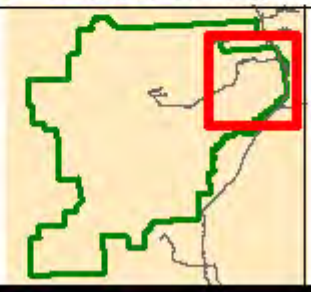
The East Fork Wolf Closure was implemented on May 17, 2017 as per policy to close wolf denning areas used in the last two years until denning activity for the current year is determined. Wolves last denned in this location in 2015 and 2016. The area closed encompassed an area of the East Fork Toklat River upstream from the bridge, adjoining the permanent Sable closure. After it was confirmed that no wolves denned in this location in 2017, the closure was opened on July 6, 2017.

2017 Wolf Closures

Denali National Park & Preserve



Date of Map:
8/31/2017



N
W E
S

Denali National Park
and Preserve
Wildlife Management

0 1 2 3 4 5 6 7 8 9 10 11 12

Miles

Active Research

EFFECTS OF HARVEST ON VIEWING

In 2010, Denali National Park and the University of Alaska Fairbanks, with the cooperation of the Alaska Department of Fish and Game, began a study of wolf movements, wolf survival, and wolf viewing opportunities along the Denali Park Road. This study investigated a variety of factors that might influence sightings of wolves on the park road, including:

- Wolf abundance
- Harvest of wolves outside of park boundaries
- Den locations
- Pack size and composition (adults, pups, etc.)
- Individual behavior
- Pack social structure
- Pack proximity to the road

This study informed the NPS on how wolf management practices outside Denali's boundaries impact wolf populations and the likelihood of seeing wolves within the park.

Data were collected in both Denali and Yellowstone on wolf sightings, pack sizes, harvest near the park boundaries, and den site locations in the park. The study found that wolf population size and how close dens sites were to roads had the largest impact on the frequency of wolf sightings. However, harvest seemed to significantly reduce the number of sightings.

In Yellowstone, visitors had a 45% greater chance of seeing a wolf in years after there was no harvest of a wolf from a nearby road pack. In Denali, the presence of a protective buffer against harvest resulted in almost twice as many sightings in the park (Figure 4).

The results were analyzed in an article published by Bridget Borg and collaborators from Yellowstone and the University of Washington, titled "Implications of Harvest on the Boundaries of Protected Areas for Large Carnivore Viewing Opportunities."

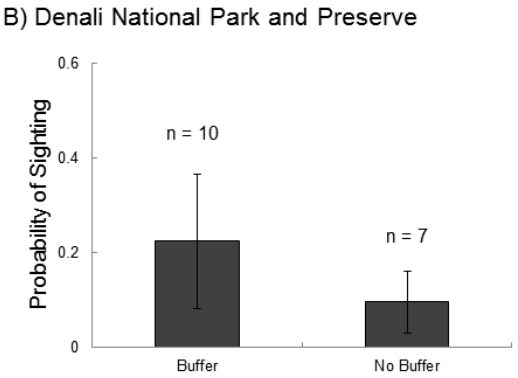


Figure 4. Probability of seeing a wolf in Denali during the 10 years the buffer was present (left) versus the during the following seven years when the buffer was removed (right).

Harvest could be impacting the number of sightings because it reduces the number of wolves, but it could also be causing behavioral changes in the wolves that make them less likely to be seen. After packs have experienced trapping or hunting, surviving wolves may learn to avoid humans. Alternately, wolves that are more bold by nature — those which are likely to be seen by visitors — may also be harvested more often due to their willingness to approach novel objects. Over time, this trait could disappear from the wolf population until most wolves avoid humans altogether. Both of these changes would result in fewer wolf sightings. The park is continuing to collect data on wolf sightings and harvest and will continue to analyze this issue.

OTHER ACTIVE RESEARCH

- Masters student Kaija Klauder continued deploying trail cameras at carcass sites in winter 2017, as well as collecting scat and conducting track surveys.
- The non-invasive genetics project continued summer 2017, with samples collected from the Riley Creek den site on the Teklanika river, as well as from collared and deceased wolves.

Outreach and Collaborations

TALKS

- Poster: "A landscape of unease: scavenging dynamics and habitat use of mesocarnivores in the presence of wolves", National Park Service Centennial Science and Stewardship Symposium, Fairbanks, AK – Kaija Klauder

- Poster: "Determining Pack Composition and Identification of Individual Wolves from Trail Camera Photos", National Park Service Centennial Science and Stewardship Symposium, Fairbanks, AK – Bridget Borg and Kaija Klauder

- "Gifts of An Enemy: Scavenging Dynamics in the Presence of Wolves", WISE 2017 Science Lecture Series, Glenallen, AK – Kaija Klauder

- "Gifts of an Enemy: Scavenging Dynamics in the Presence of Wolves", MSLC Summer Speaker Series, Denali National Park, AK – Kaija Klauder

- "Wolf Buffer Proposal", March 2017 Alaska Board of Game Meeting , Fairbanks, AK – Bridget Borg

- "Wolf Townships History", Resources Day, Denali National Park, June 2017– Bridget Borg

OUTREACH

- Wildlife Research Techniques session with Discovery Camp Participants – Erica Goad, Kaija Klauder

- Wolves of Denali Field Course August 7-9th – Bridget Borg

- Skype wolf class with Summer Nature Camp in Louisiana, July 2017 – Bridget Borg

- Terra X German documentary filming August 2017 – Bridget Borg

- Snowshoe Hare hands-on research involvement with student groups from around the state, June-August 2017 – Kaija Klauder

COLLABORATIONS

- Scavenging dynamics of mesocarnivores, and habitat selection and movements of coyotes, Kaija Klauder, University of Washington

- Determination of the fecal microbiota of wild wolves, Mark Roberts, AgResearch New Zealand

- Animals on the Move, University of Washington, NASA ABoVE project

- Dall Sheep Survival; University of Washington, NASA ABoVE project.



Technician Kelly Sivy collects a hair sample from a den site. *NPS Photo / Kaija Klauder*