National Park Service
U.S. Department of the Interior

Denali National Park and Preserve

2016 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 seen from the Park Road.
Children learn how to use telemetry equipment during Denali Discovery Camp.
A gray wolf in Denali National Park.
View of Denali National Park.

Contents


289

Background

Wolves are one of six keystone large mammal species in interior Alaska, along with grizzly bears, black bears, moose, caribou, and Dall's 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 National Parks within the Central Alaska Monitoring Network (CAKN) including Denali National Park and Preserve (Denali), 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 and study wolves in Denali in 2016. The main goal of monitoring is to track wolf populations and movements. 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 parks, managers want to know where active wolf dens and rendezvous sites (pup rearing areas) 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, is important for evaluating long-term changes in wolf populations in Alaska. Information gathered on the Denali wolf research project can also help scientists determine whether wolf packs within the Park are being impacted by activities happening outside of the Park.

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 also of great significance to Denali's visitors because of the unique opportunities to view wolves in Denali. The 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.

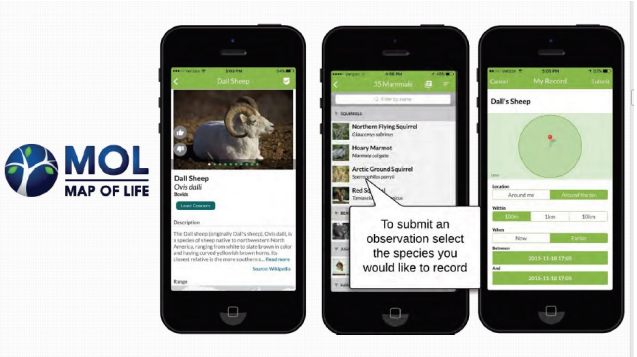
Park-wide monitoring of wolves in Denali was initiated by Resource Management Ranger John Dalle-Molle in 1986, with principal investigators L. David Mech and Layne Adams. Field work and project management from 1986 to present has been conducted by Dr. Layne Adams, John Burch, Tom Meier, Dr. Steve Arthur, and Dr. Bridget Borg. In 2016, Dr. Bridget Borg, Kaija Klauder and contract biologist Kelly Sivy worked for the wolf project.

Opposite Page: Gray wolves in Denali as seen from the Denali Park Road. Bottom right photo shows a pup crossing the road behind a Denali shuttle bus. Viewing wolves from the Park Road is a unique experience for visitors to Denali National Park.
Above: Wolf tracks along a river bed.
NPS Photos

2016 Summary

In 2016, 10 wolf packs were monitored in the Denali study area (Figures 1,2) and 68 aerial tracking flights were flown to record wolf pack locations, locate den sites, and obtain pack counts and estimates of pups produced. Information from these flights also documented wolves feeding at 11 moose carcasses, 3 caribou carcasses and 2 carcasses of unknown species. Nine wolves were captured and collared in 2016 including 2 recaptures of wolves previously collared. Eight collared wolves died in 2016, and we estimated that 29 pups were born to monitored packs and survived to the fall.

In addition to addressing our long-term monitoring objectives, in 2016 Denali continued collaboration on several wolf research projects. A multi-park project with Yellowstone, Grand Teton and Yukon-Charley is investigating the impacts of harvest on wolf packs that primarily reside within National Parks or Preserves. Denali's part of this project has focused on obtaining detailed pack compositions data from genetic sampling (page 18) and through photos (pages 20-21). Additionally, we continued to collaborate with Dr. Laura Prugh and Master's student Kaija Klauder on a project investigating mesocarnivore-wolf interactions (pages 24-25). We supported and promoted the development, deployment, and use of mobile application (Map of Life, https://mol.org/) that enables visitors to record wildlife sightings along the Denali Park Road. In 2016, over 200 citizen scientists downloaded and used the app to track wildlife sightings in Denali.



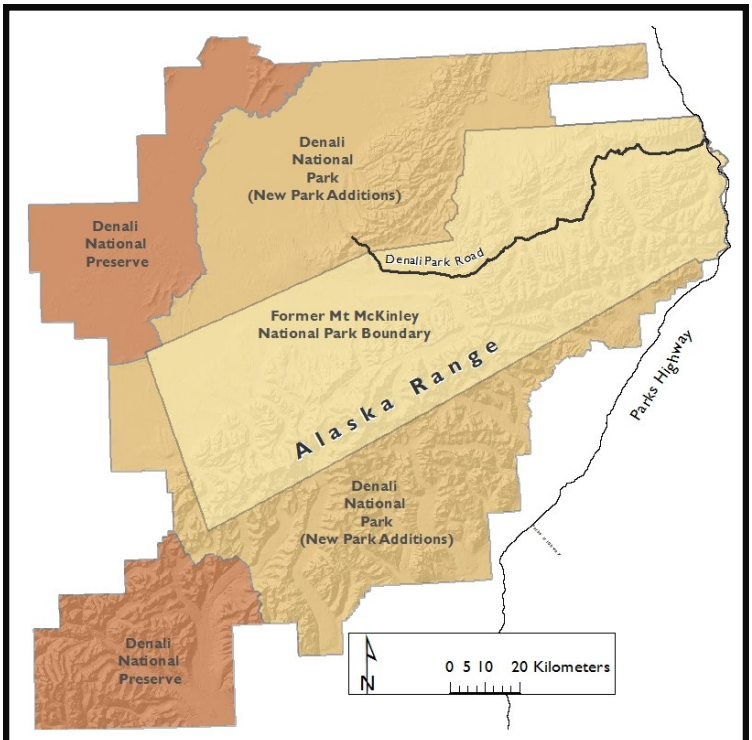


Figure 1. Map of Denali National Park and Preserve. Wolf Project study area includes all area north of the Alaska Range. The new park additions are north and south of the original park boundary (tan) and the Preserves are in the northwest and southwest (red).

What does wolf "harvest" mean?

Wolf harvest refers to any take (kill) of a wolf by hunting , trapping or snaring. Subsistence and sport harvest of wolves are permitted in the Preserves and subsistence take only is allowed in the new park additions of Denali, but all hunting and trapping was prohibited in the area of the original Mt. McKinley National Park (see figure above). Trapping and hunting open seasons and bag limits are set by the Alaska Board of Game and implemented by Alaska Department of Fish and Game (ADFG). In 2016, wolf hunting in the Game Management Units adjacent to the park was open from August 10 to May 31 with a bag limit of 10 wolves. The trapping period was set from November 1 to April 30, with no bag limit. Hunters and trappers are required by law to seal (record)harvest with an ADFG representative within 30 days after the trapping season has closed in the unit where the animal was taken.

Denali Wolf Population

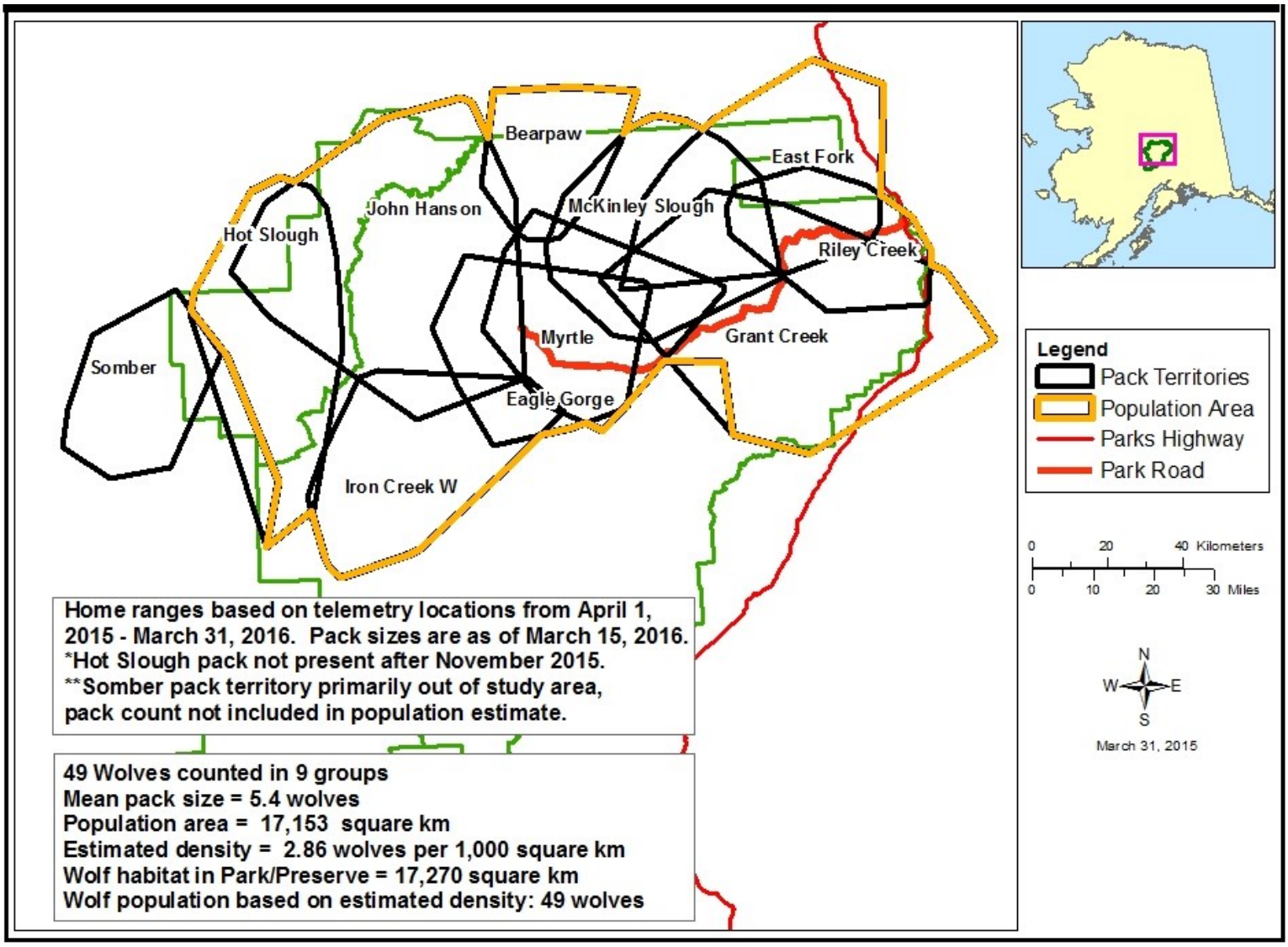


Figure 2 (above). Wolf pack territories, based on Spring 2016 counts, Denali National Park.

Table 1 (right). Wolf population estimates by pack for Spring and Fall 2016, Denali National Park. *Somber and Squeeze packs are located outside of the survey area, and are not included in total population counts.

Wolf Population Estimate	Spring 2016	Fall 2016
Eastern Packs		
East Fork	2	3
Grant Creek	8	12
Myrtle	6	5
Riley Creek	7	14
Western Packs		
Bearpaw	9	16
Eagle Gorge	2	5
Hot Slough	1	0
Iron Creek West	14	10
John Hansen	3	8
McKinley Slough	2	2
Riley Creek West		2
Somber*	2*	7*
Squeeze*		5*
TOTAL	**49**	**77**

MORTALITY & REPRODUCTION

Mortalities of collared wolves were noted during aerial tracking and observation and through weekly GPS data checks. An effort was made to recover all collars and determine cause of death of the collared individual. Occasionally carcasses were brought to the Alaska Department of Fish and Game for necropsy to determine cause of death. Otherwise, cause of death was determined in the field through a field necropsy or external examination. When the carcass was consumed or decomposed to the point where cause of death was inconclusive, the cause of death was often recorded as "unknown natural" unless there was significant reason to conclude that there was an anthropogenic cause of mortality (Table 2).

Den and rendezvous locations, activity at den locations, number and color of pups were recorded during aerial tracking flights and trail camera photos. Occasionally den site and rendezvous locations were ascertained from GPS locations of breeding individuals. Fall aerial tracking and survey flights focused on obtaining repeated adult and pup counts and were used to estimate recruitment rates of pups from spring to fall (Table 2).

Top: The Grant Creek breeding male wolf with a ptarmigan.
Bottom: A gray wolf seen from the Denali Park Road.

TABLE 2: 2016

	Reproduction		Collared Wolf Mortality		
PACK	**Denned**	**Fall Pup Count**	**Natural**	**Human-Caused**	**Description**
Eastern Region					
East Fork	Yes	Suspected Failure		1	1 harvested*
Grant Creek	Yes, 2 dens	6	2		2 killed by wolves
Riley Creek	Yes	8			
McKinley Slough	No	N/A			
Lone/Dispersing				1	1 harvested*
Western Region					
Bearpaw	Yes	7			
Eagle Gorge	Yes	1			
John Hansen	Yes	4			
Myrtle	Yes	0	1	1	1 natural unknown, 1 harvested*
Iron Creek West	Yes	3	1		1 natural unknown
Hot Slough			1		1 starved
Out of Study Area					
Somber	Suspected	Unknown			
TOTALS		**29**	**5**	**3**	

*Harvest can occur as shooting, trapping, or snaring

CARNIVORE CLASH

The following interaction was documented by long-time pilot Dennis Miller in late July. He ranked it as one of the top three wildlife events he'd ever witnessed.

In the summer of 2016, the Eagle Gorge pack denned at a traditional location on Pirate Creek. Dennis Miller, an experienced wolf tracking pilot, saw two pups at the den on several occasions. The day after one such sighting, he flew over the den and discovered that it was abandoned. Following the VHF signal from their radio collars, Dennis located the breeding male and female wolves about two miles away from the den near the Clearwater River. He saw one pup sitting upright by the male, who was curled up and resting. The female was about 20 meters away, pacing and agitated near a patch of brush. And with good reason: inside the brush was a grizzly, standing over a pile of scraped-up brush and dirt that grizzlies create to cover a kill. The pile was very small – too small to conceal a moose or caribou.

As the female traced a semi-circle less than 10 meters from the bear, Dennis made a low pass to try and get a better view of the pile. At this, the bear spun around and started to slowly walk away. The female wolf followed and began biting at the hindquarters of the bear. The bear seemed annoyed but did not respond. Finally, the bear turned and stared at the wolf. Less than two meters apart, nose to nose, their gazes locked. Then the bear turned and continued to walk away. The female wolf redoubled her efforts, and the grizzly started to run, splashing across a river channel with the wolf in pursuit. When the bear reached the main channel, it swam across. The wolf stopped on the bank, where she watched the bear continue to walk away. During this entire episode the male wolf and pup did not stir.

An older member of the Riley Creek Pack.

The female wolf now walked back to the pile, of brush often glancing back to make sure the bear stayed gone.

She dug around in it, then reached down and picked up its contents in her jaws: the body of her dead pup. She carried the body a little ways away and dropped it, then returned to the pile and continued to dig at it. At this point the surviving pup started walking towards the dead sibling. The female ran and prevented the pup from going any further. Then she returned to the pile. Again, the pup tried to approach its sibling, and again, she prevented it. For a third time the pup headed towards it, and for a third time she stopped it. Still the male had not raised his head or twitched an ear, although there did not appear to be anything wrong with him.

At this point Dennis had to leave the scene to locate other packs, leaving many questions unanswered. Wolf monitoring is full of such tantalizing fragments, highlighting the complexity and intensity of wild lives.

Pack Narratives

EASTERN PACKS

East Fork

Pack Counts: Spring- 2, Fall- Unknown
Collared Wolves: 1508GM, 1607GM

The East Fork pack occupied a territory on the northeastern part of Denali in 2016. The pack experienced the loss of all collared members in spring 2016 and the fate of the remaining members is unknown.

In mid-February 2016 a male from the East Fork pack was collared (1607GM) and by late February, 1607GM dispersed north. 1607GM was shot in March 2016 west of Fairbanks near the Chatanika River. The spring pack count for the East Fork pack was two: 1508GM and an uncollared black wolf companion. On May 4th, 2016, 1508GM was seen near at the Pinto Creek rendezvous site (last used by the Pinto Creek pack in 2007).

Three days later, 1508GM was seen near a hunting camp outside of the park. Later in the day the collar was radio tracked to the camp. Since that time, no further data has been received from the collar and it is presumed that this wolf was shot and the collar subsequently destroyed. On May 15th, a dark gray or black wolf was seen at a den hole near the Pinto Creek pack rendezvous site, near the same location where 1508GM was seen on May 4th. The black wolf at this den was likely the same wolf that was previously seen with the presumed killed 1508GM.

During numerous flights to check the status of the Pinto Creek den site, a total of two pups were seen (one black and one gray) in early June. One pup (gray) was seen later in the month, with the last sighting on June 28th. The black female was seen at the den site on May 23rd and was not observed at the den site during subsequent checks. On July 24th, after a period of heavy rains, new vegetation was observed growing at the entrance of the den site, a clear sign that the den was no longer being used.

On July 26th, park biologists conducted an investigation of the den site. As seen from the air, there was new vegetation around the entrance to the den site and evidence that the most recent use of the den was by porcupines. Numerous hair samples were collected and fecal samples were swabbed and will be submitted for genetic testing. Nothing else found was at the den site area. There were no carcasses or signs of recent use by wolves. Without a collar on the black female, the fate of her and her pups is unknown.

Tracks of two to three wolves have been seen repeatedly in the former East Fork territory in the winter of 2016. Additionally, three black uncollared wolves were seen on November 18, in the former East Fork pack territory. Hopefully, with the genetic information from the samples collected near the den site, it will be possible to verify if any wolves found and collared in future months are indeed the same female or descendants of the black female. Although it is unfortunate to lose track of this long-tenured and well-followed pack, it should be noted that the potential loss of this pack does not mean the loss of the lineage of these wolves.

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.

A Grant Creek pup with fall foliage/*NPS photo*

Wolf 1202BF was originally a member of the East Fork pack. In 2013, she founded the Riley Creek pack with a mate. In summer 2016, one of 1202BF's pups, 1601GM, dispersed, found a potential mate and appears to be establishing a new territory along the Park Road Corridor (see Riley Creek West).

Grant Creek

Pack Counts: Spring– 6, Fall– 12
Collared Wolves: 1404GF, 1501GM, 1602GF

The Grant Creek pack 's territory spanned the Alaska Range in 2016, with the wolves commonly coursing the large mountain range in summer and winter.

In February 2016, 1602GF, a pup from the Grant Creek pack was collared in the south Wyoming Hills area. In July, it was verified that 1404GF denned at the Aspen den site and used the nearby Murie den, both on the East Fork River, as a rendezvous later in the summer. She was seen with five gray pups on July 25th. 1602GF was predominantly south of the Alaska Range at a presumed den site along the Chulitna River. 1501GM bounced between both den sites. On July 26th, 1602GF and 1501GM were seen near Costello Creek with 6 pups. The two den sites are over 18 miles apart and separated by the main Alaska Range with high passes and glaciers.

Throughout the summer 1602GF remained south of the Alaska Range, ranging from the Chulitna River to Costello Creek. By August 21, she returned to the Aspen den site. Although there were a maximum of six pups seen at each of the den sites in 2016 (12 pups maximum between the Chulitna and Aspen dens), only six pups were seen later in the fall with six adults.

The Grant Creek pack spent the winter traversing the Alaska Range, ranging between the Cantwell area and Toklat Road Camp and as far east as Teklanika and Calico Creek. In December, the Riley Creek pack and Grant Creek pack had an apparent run-in which began on December 10th, when the packs encountered each other on Sable Pass. All of the pack members then ran towards the Stony River, where a violent skirmish near an old moose kill site resulted in the death of the Grant Creek females 1404GF and 1602GF on December 12th. The remaining collared Grant Creek member, 1501GM then traveled south of the Alaska Range, with 1202BF

A gray wolf in new snow /*NPS Photo*

and 1406BM from the Riley Creek pack in pursuit. On December 14th, it appeared that the wolves met again near Windy Creek, after which 1501GM went south and the Riley Creek wolves returned to the north side of the Alaska Range.

Investigation of 1602GF revealed that she had not been pregnant nor nursed pups, thus she was not the mother of the litter of pups that were born at the southern Grant Creek den site the previous summer.

Prior to the skirmish, the Grant Creek pack numbered at least 11 wolves. Following the death of the two collared females, 1501GM was seen with three other wolves that appeared to be pups.

McKinley Slough

Pack Counts: Spring– 2 Fall– 2
Collared Wolves: 1402GF, 1306GM

The McKinley Slough "pack" has technically been a pair since Fall 2014 and is composed of two collared wolves, 1402GF and 1306GM. In February 2016, the female wolf (1402GF) was recollared. Attempts were made to recollar her mate, 1306GM, but he evaded capture by staying in thick trees along the East Fork River. The spring 2016 count remained at two wolves.

In 2016, the McKinley Slough pair continued to range in the Kantishna Hills and along the confluence of the East Fork and Toklat Rivers with some movements as far south as the headwaters of Boundary Creek in late June and early July. There was no evidence of denning.

Myrtle

Pack Counts: Spring– 6, Fall– 5
Collared Wolves: 1503GM, 1504GF, 1603BM

The Myrtle pack ranged between Kantishna on the west and east to Stony Creek. In February 2016, a large black male (1603BM) from the Myrtle pack was collared on the north side of Brooker Mountain. The spring 2016 pack count was six wolves, unchanged from the fall 2015 count. The pack denned along Glen Creek and two black pups were seen on July 25th.

In late August 2016, GPS locations indicated that 1603BM had died. Based on the GPS data, he likely died in late July. The carcass was too decomposed to determine the exact cause of death.

Although two pups were seen as late as mid-September, subsequent counts showed no indication of pups with the adult pack members.

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 there was evidence that she was trapped or shot in December 2016. Her collar was presumably destroyed.

Riley Creek

Pack Counts: Spring– 7, Fall– 14
Collared Wolves: 1402GF, 1306GM

The Riley Creek pack ranged mainly along the Park Road corridor from Riley Creek to just west of Sanctuary River and south to Refuge Valley. In February 2016, a two- year old male from the Riley Creek pack was collared with an Iridium collar. The Spring 2016 pack count for the Riley Creek pack was seven, down two from the Fall 2015 count.

In July, mid-May, 1601GM separated from 1202BF and 1406BF. 1202BF and 1406BM denned along the Sanctuary River and used rendezvous sites in the nearby area, a change from the den site they used the previous

two years. The Riley Creek pack had eight pups in the summer of 2016.

In December, the Riley Creek pack and Grant Creek pack had an apparent run-in which began on December 10th and resulted in the death of at least two Grant Creek females (see Grant Creek pack narrative, page 11).

Riley Creek West

Pack Counts: Fall– 2
Collared Wolves: 1601GM

In mid-May 2016, 1601GM separated from 1202BF, 1406BF and the rest of the Riley Creek pack and headed west. During the summer 2016, 1601GM ranged primarily along the Park Road corridor from Toklat west to Wonder Lake and Kantishna. He seemed to be using areas sandwiched between the Myrtle pack to the north and the Eagle Gorge pack to the south. In July 2016, 1601GM was seen with a smaller gray companion, presumably a female.

WESTERN PACKS

Bearpaw

Pack Counts: Spring– 9 Fall– 16
Collared Wolves: 1006BF, 1502GM, 1606GM

The Bearpaw pack uses a territory along the Bearpaw and Flume Rivers, along the northern boundary of the Park. In February 2016, a gray yearling from the Bearpaw pack was collared (1606GM). In summer 2016, the pack denned near "Bearpaw Lake," at a den site considered one of the oldest known den sites in the park.. Seven pups were produced in the pack in 2016.

A member of the Riley Creek pack. *NPS Photo / Jake Gaposchkin*

John Hansen

Pack Counts: Spring– 3, Fall– 8
Collared Wolves: 1302GM, 1605GM

The John Hansen pack primarily ranged south and southeast of Lake Minchumina in 2016. In February 2016, a two-year old gray male from the John Hansen pack was collared (1605GM). 1605GM was thin and the hair on his flanks and belly was thin and matted with sebum. Lice infestation is the suspected cause.

One of the John Hansen males (1302 GM) was confirmed to be using the Foraker Dune Den (used by Hot Slough in 2008). Interestingly, the den used by the John Hansen pack in 2014 was also confirmed to be active this year and an uncollared gray wolf was seen at the den site. Four pups joined the John Hansen pack in 2016.

Eagle Gorge

Pack Counts: Spring– 2 Fall– 5
Collared Wolves: 1506GM, 1604GF

In 2016, the Eagle Gorge pack ranged along McKinley Bar, north to Brooker and south to McGonagall Pass. In February 2016, the light gray companion of 1506GM was captured and collared near McKinley River, south of the Muddy River.

In July 2016, The Eagle Gorge pair denned along Pirate Creek. Two gray pups were seen in July, but one pup was killed by a grizzly bear (see page 9) and only one pup remained with the two collared adults as of July 26th. .At some point in late summer 2016, one other gray wolf and a pup joined the Eagle Gorge pack bringing the pack count up to five individuals in fall 2016

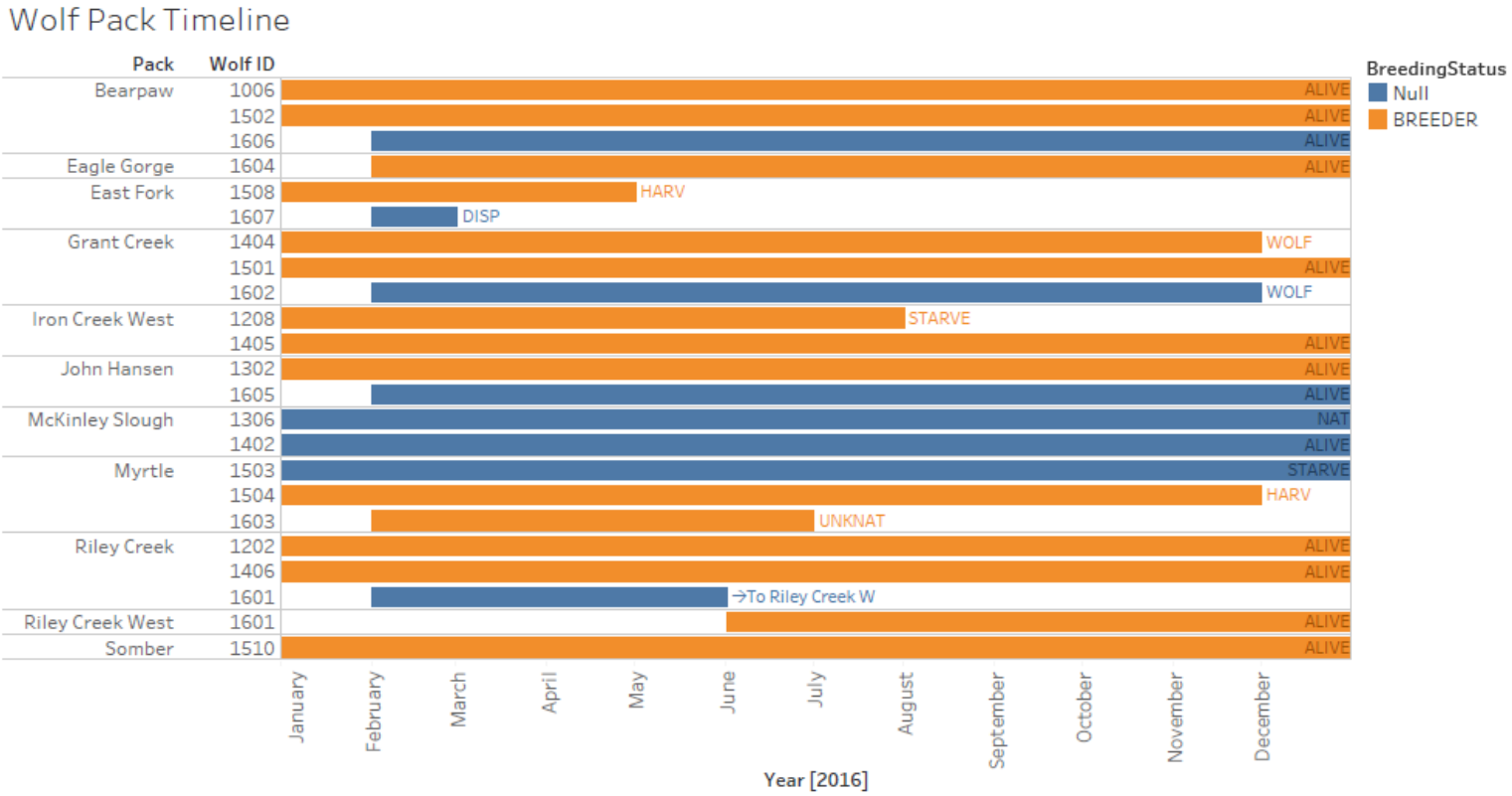


Figure 3. Wolf pack timelines shown for individual Wolf IDs. Orange lines indicate breeding wolves, blue lines are non-breeders. The length of the lines show the duration of the individual in that breeding status through 2016. The fate or cause of death of each individual is written in text at the end of the line.

A yearling gray wolf "babysits" black pups, members of the Riley Creek pack

Iron Creek West

Pack Counts: Spring– 14 Fall– 10
Collared Wolves: 1208WF, 1405GM

The Iron Creek West pack ranged north of the Alaska Range from the McKinley Bar to Highpower Creek. The pack denned at a previously unknown den site beginning in May 2016 and in July 2016, two gray pups were seen with pack members. The Iron Creek West female 1208GF died of unknown natural causes in August 2016. It appeared that a total of three pups were in the pack in early October 2016.

Hot Slough

Pack Counts: Spring– 1, Fall– 0*
Collared Wolves: 1304GM

By 2016 only one wolf remained from the former Hot Slough pack. In January 2016, 1304BM was found dead near Lake Minchumina. Based on a field investigation, 1304BM appeared to have died from starvation.

Somber (monitored infrequently)

Monitoring of this pack is minimal as the Somber territory shifted almost entirely out of the park and the pack territory and pack count were not included in the spring 2016 population and density estimate for wolves in Denali National Park and Preserve.

A gray female wolf (1510GF) was seen with one other wolf, although monitoring flights were infrequent. The minimum pack count for Somber in Spring 2016 was two wolves. As of July, based on GPS locations, it appears that the Somber female denned this year, outside of the western boundary of the park. No pup counts are available.

Wolf Management

COLLARING

Denali has been collaring members of the wolf population since 1986 in order to track movements, estimate territory locations 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. 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, color, and blood and other tissue samples for genetics and disease analysis, were gathered from captured wolves.

In 2016, 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.

TRAIL CAMERAS: THEIR USES IN WILDLIFE RESEARCH

Remotely-triggered, motion-sensitive cameras ("trail cameras") have quickly become a staple tool in wildlife research. They allow researchers to literally see into the lives of animals without disturbing their natural behavior. Researchers at Denali are using trail cameras for several interesting research projects and for wolf management purposes. The possibilities are nearly endless for future ideas! Below we showcase several examples of the products and uses of trail cameras in wildlife research.

Cameras are placed at wolf dens that are used over and over. The photos from these cameras help researchers to determine pup counts every year and understand pack dynamics.

Identifying individuals and tracking their growth. Characteristics used to identify individual wolves include collars (if present), overall color, tail markings, facial markings, and other markings on their shoulders, backs, and legs. Generally multiple characteristics must be used. Wolves often look similar to one another and may

A collared wolf seen from the Park Road. *NPS Photo / Robert Valarcher*

Two wolves seen outside of a den from the trail camera. *NPS photo*

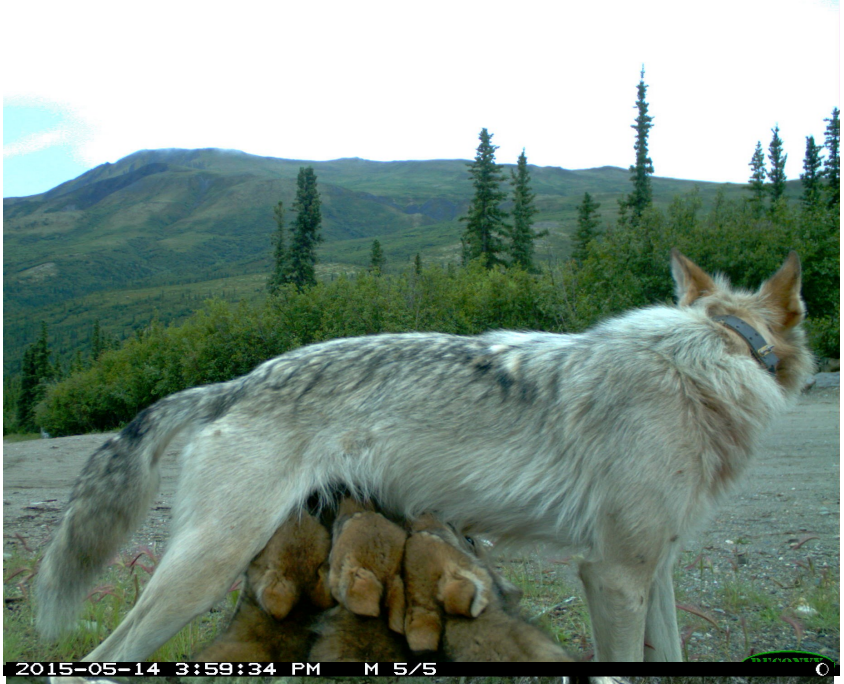
change appearance somewhat with the seasons, and lighting and photo quality can alter appearances as well. See Page 22 to learn more about trail camera photo identification of wolves.

Examining inter-species and intra-species dynamics at scavenging sites and elsewhere. Interactions between members of the same species and even members of different species can be studied using trail cameras. Behavior at carcass sites is especially interesting. Researchers have been using cameras to study how vigilant different wildlife species are at a place such as a kill site where there is great reward but also great risk to being there.

Capturing natural behavioral dynamics without fear of human influence. Cameras offer the opportunity for people to peek into the everyday lives of wildlife, behaviors which we may not see if the animal is aware that we are there. Examples include playful behavior, dominance displays, howling, and suckling pups.

It is important to put the cameras in protective boxes and use cable straps that are rugged enough to take the weather and some "mishandling" by the wolves (see upper photo to the right).

These are just a few ways that cameras are being used in Denali to learn more about wolves and other wildlife, in a way that is not invasive, is relatively inexpensive, and tells fascinating stories.



Park biologists use trail cameras to capture photos like the ones featured here.

Top: A wolf chews on the camera cord at night.
Middle: Wolf pups nurse from their mother.
Bottom: Two wolves howl outside of their den.

NPS Photos

CLOSURES

Three closures around den sites were put in place in 2016 following Denali's Wolf Human Management Plan.

7 Mile Wolf Closure

The 7 Mile Wolf Closure was implemented on April 19, 2016 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 2014. After it was confirmed that no wolves denned in this location in 2016 (porcupines were occupying the den instead), the closure was opened on June 7, 2016.

Sanctuary Wolf Closure

The Sanctuary Wolf Closure was implemented on May 25, 2016 as per policy. Wolf activity in the area was documented at the time of the closure. The area closed encompassed the north portion of backcountry unit #5, bounded to the south by a line approximately 6.5 miles upstream of Sanctuary Campground. After the wolves moved away from the den site and the pups had grown to a point where human disturbance was no longer a concern, the closure was opened on October 3, 2016.

Wildlife closure sign from the Denali Park Road near Sable Pass

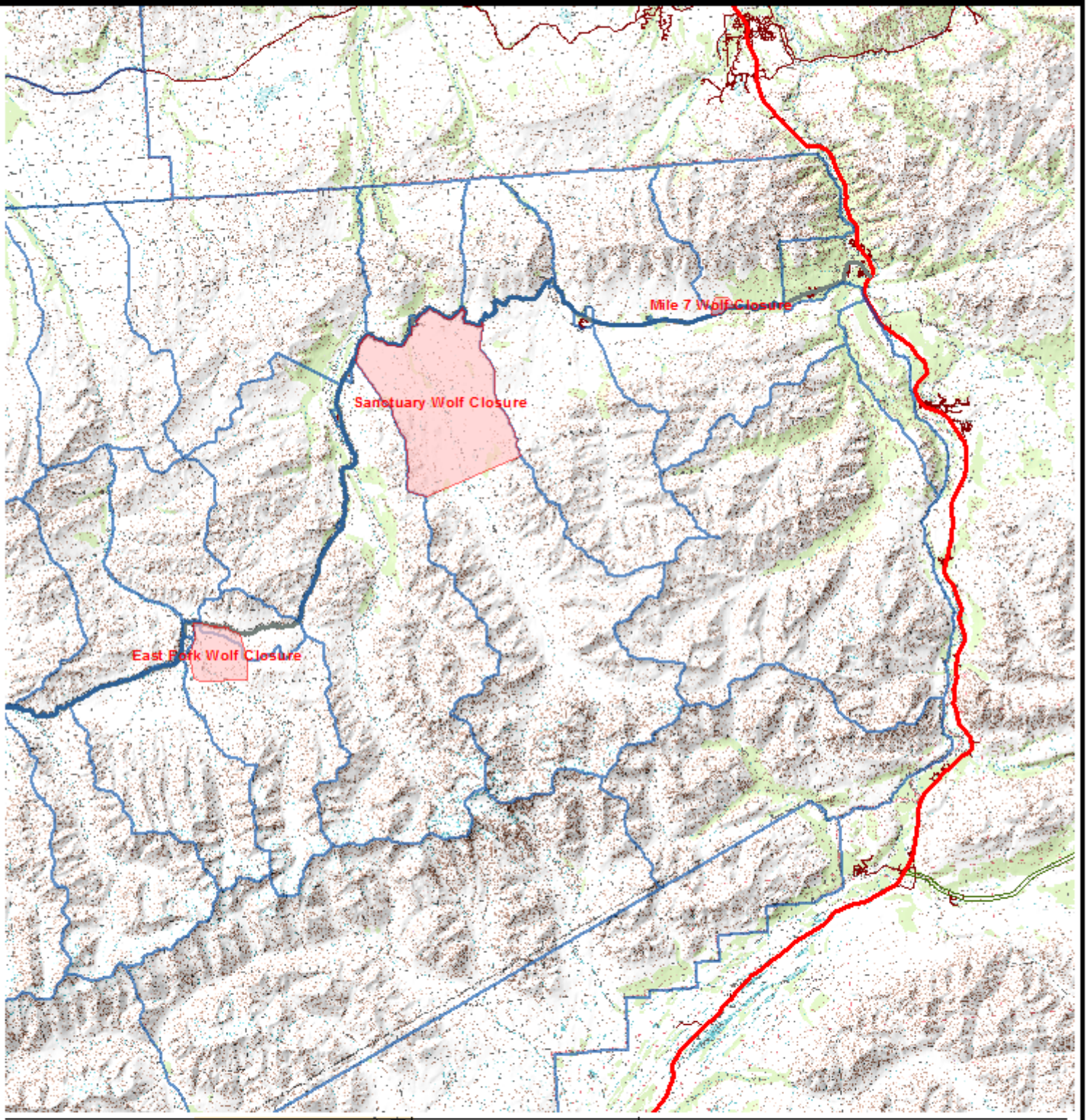
East Fork Wolf Closure

The East Fork Wolf Closure was implemented on April 25, 2016 as per policy. Wolves were currently denning at the time of closure and had also denned at this location in 2013, 2014, and 2015. The area closed encompassed an area of the East Fork Toklat River upstream from the bridge, adjoining the permanent Sable Pass closure. After the wolves moved away from the den site and the pups had grown to a point where human disturbance was no longer a concern, the closure was opened on October 3, 2016.

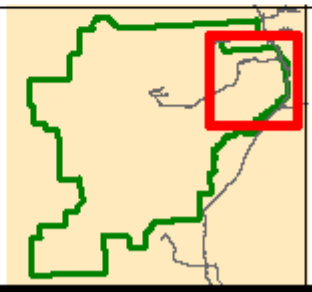
Left and Right: Gray wolves seen from the Denali Park Road.

2016 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

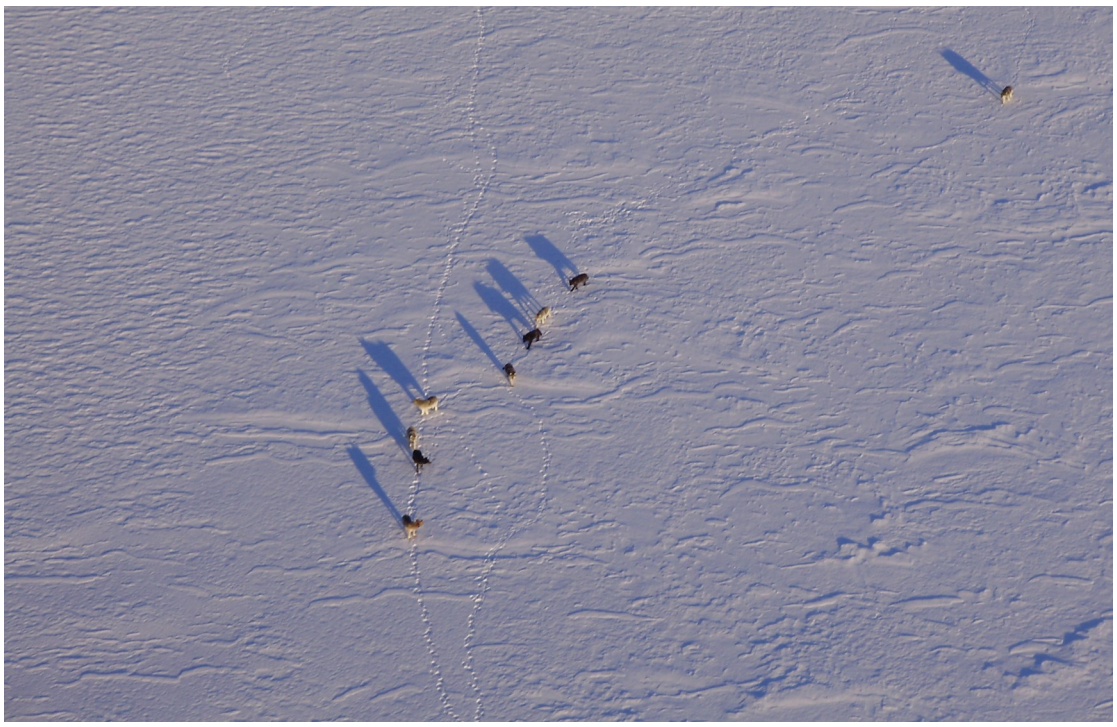
Miles

Active Research

GENETICS PROJECT

by Kaija Klauder and Dr. Bridget Borg

Understanding the fate of all members of a wolf pack can be very challenging. While VHF (Very High Frequency) and GPS collars are a critical tool in monitoring wolf population in remote areas, only a few animals from each pack are collared. This means that most wolves in Denali are not "marked" in a way that allows researchers to track their fate over time. Other methods may be used to improve the ability to track causes and locations of wolf mortalities for uncollared members of packs.



Aerial view of the Bearpaw pack /*NPS Photo*

Researchers at Denali are conducting a pilot study using non-invasive genetic sampling to create a "library" of genetic profiles of wolves. This library is built by visiting den and rendezvous sites shortly after wolves have left. All of the wolves in a pack usually spend time at the den and rendezvous site, and researchers collect genetic samples from scats and hair deposited at the heavily used site. A thorough effort to sample scat and hair at these sites should yield at least one sample from each individual in the pack.

As part of this project, in 2016 biologists visited three den sites (at Pinto Creek, East Fork River, and Sanctuary River) and one rendezvous site (along the Sanctuary) to swab fecal samples from wolves, document the den site locations and record use patterns.

This genetic material is valuable. It yields information on the number, gender, and relatedness of individuals within a pack, as well as how related packs are to each other.

The next step is to use the data from our genetic library to track the fate of the wolves. By obtaining genetic samples from carcasses of wolves, either found in the park or from samples solicited from trappers and hunters, researchers hope to clarify questions about the fate of .wolves in and outside of Denali.

This project has the potential to provide valuable and elusive information on how many wolves born in Denali are hunted outside its borders, and where these losses are located. While there is speculation about the role of harvest on Denali's wolf population, objective research on it's effects have been previously lacking. This information could help Park and State managers make informed decisions to ensure that wolf populations remain available for Park visitors and hunters alike.

Opposite page (clockwise from top left): a biologist during a den check. Biologists swab scat for genetic material. A wolf's paw during a capture for collaring.

IDENTIFYING DENALI'S WOLVES

by Kaija Klauder and Dr. Bridget Borg

Adolf Murie's 1944 book The Wolves of Mount McKinley was a landmark study on wolf behavior, biology, and ecology. Murie's time spent observing one pack allowed him to distinguish individual wolves. By presenting wolves as individuals with specific roles within the pack, he helped erode stereotypes of wolves. Murie's work was instrumental in changing wolf management policy. Subsequent researchers in Denali have formally monitored wolf abundance, territories, and reproduction using radio-collars and aerial tracking since 1986 but reliable data on pack composition and age structure has been limited.

There is a growing body of research elucidating the importance of social group composition such as breeding status, sex, age and/or size of individual wolves within a pack. Wolf pack composition can influence a pack's hunting success, territorial defense, recruitment, and pack persistence. A Centennial Challenge Project initiated in 2016 is investigating rigorous methods for identifying pack composition, including evaluating methods for reliable identification of individual wolves in packs.

Methods

Visual recognition of individual wild animals from photographs remained an uncommon tool in modern peer-reviewed research until the advent of algorithms which could "prove" that the stripes of a tiger in one photo matched those in another. Individual identification of wolves provides more opportunity for human error and bias, as they lack clearly defined patterns of other animals such as tigers and leopards. Previous claims of regarding the ability to identify individual wolves during aerial tracking in Denali specifically have drawn criticism.

As part of the Centennial Challenge project, we investigated the potential for using images captured from high-quality trail cameras deployed at den sites and winter wolf kill sites to determine pack composition for packs in Denali through identification of individual wolves. We analyzed over 11,000 photos of wolves from 2013 to 2016.

Field Marks

The pattern and color of facial markings can be useful for distinguishing individuals, though to be reliable it requires high quality photos and can be subject to seasonal change.

Chest blazes and bars are particularly useful for differentiating black wolves. Gray wolves can also have distinctive chest patterns. Related wolves within a pack can be quite distinctive in appearance, although this is not always the case. The photo series below, from left to right, shows a young gray wolf, a young black wolf, a collared black wolf which is graying with age, a different young black wolf and another young gray wolf. What distinguishing characteristics can you detect on the wolf to the right?

The appearance of the saddle/shoulder/back area is quite variable. On a gray wolf, the level and angle of the area of darker-tipped guard hairs on their back can vary, as can the level and angle of any lighter coloration below that before it transitions to the ventral white. These lines

From left to right - trailcam / NPS photo, trailcam / NPS photo, Flickr stock photo, trailcam / NPS photo, Flickr photo / Patrick Kuyper

can also be visible on black wolves.

The size, shape, and location of the scent gland spot on the tails of gray wolves is a consistent and readily visible mark, even in nighttime photos. The shape and extent of the dark tail tip is also helpful.

Age & Sex

Literature exists on the differences in appearance and morphology of pups (<12 months) compared to adult wolves. The most helpful factors in photos are size, ruff hair, snout length, and to some extent coloration and behavior. In addition, sexual dimorphism, where males and females show different size characteristics and evidence of sexual organs, can sometimes be distinguished in photos and provide clues for determining sex of individuals (Figure 4).

Conclusions

By combining observations of size, gender, and coat patterns with additional contextual information about the packs, we believe consistent individual identification is possible assuming a photoset of suitable quality. However, it is important to recognize several limitations and that these results are from the initial stages of investigation. There are several things to be cautious about when looking through photos. Specifically, individuals can change in appearance as they age and the angle of the fur and lighting can have a dramatic effect on the appearance of wolves.

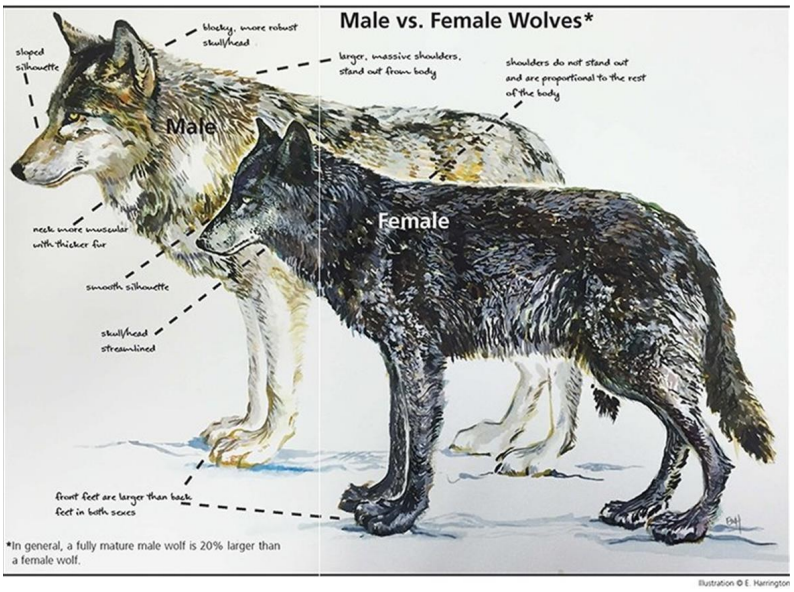


Figure 4. Differences between male and female wolves (*from Yellowstone Park Science)*

Next Steps

- Continue to deploy cameras at den and winter kill sites with the goal of accumulating a set of photos for all packs in the eastern region of Denali.
- Improve our understanding of the contribution of individual wolves to wolf viewing opportunities and wolf viewing patterns.
- Provide a compelling way to educate visitors about wolves and show the beauty and variety of Denali's fauna.

Practice

How many different wolves are pictured below? What clues did you use to help you determine your answer?




MESOCARNIVORE RESPONSE TO WOLF PRESENCE, PREY AVAILABILITY, AND SNOW PACK

by Kaija Klauder
kaija_klauder@nps.gov

A mesocarnivore is a mid-sized predator, such as a coyote, lynx, fox, wolverine, or pine marten. They are thought to compete with one another and their population sizes may be limited by wolves.

The Coyote Has Introduced Himself

In July 1928, Harry Karstens, Superintendent of what was then called Mt. McKinley National Park, noted in his monthly report the increasing presence of coyotes in the area as well as fluctuations in wolf numbers:

> "*From 1921 to 1927, the wolves in the Park were not many. The coyote has introduced himself in the past three years, as previous to that there were no coyotes in this section of Alaska but since 1927 wolves are becoming alarmingly plentiful and causing considerable havoc among our game, also the coyote is multiplying fast."*

Thus began a decades-long controversy of wildlife management in and around Denali National Park and Preserve that continues today, as scientists and managers try to understand the complex relationships among species and their environments.

In 1939, biologist Adolph Murie was hired to study the wolf "problem." His landmark research gave new insight into studies of predators and their prey. Since then, biologists have begun looking beyond simple predator-prey relationships to consider whole ecosystems, which have many interwoven parts, much like the many players in a symphonic orchestra that make up its sound.

Ripples and Cascades

What happens in an ecosystem when the abundance of an integral species – such as wolves or hares – changes? In March of 2012, Denali biologists again noticed an apparent increase in the coyote population as the number of wolves – top predators in the park – declined. Were these changes related? Increased coyote abundance throughout western North America has been attributed to the extirpation of wolves and is considered by many to be an example of "mesopredator release."

Mesopredator release is defined as the expansion in range and/or abundance of a smaller predator following the reduction or removal of a larger predator. These effects can extend beyond the small carnivores to include their prey. For example, studies in Alaska have shown that wolves may suppress coyote populations, and high coyote populations can greatly reduce the survival of Dall sheep lambs. These ripple effects throughout an ecosystem are known as "trophic cascades." Determining

A biologist collects genetic materials near a kill site./*Kaija Klauder*

how and when these cascades occur is very complex.

Who's Pushing Who?

Because wolves often kill coyotes, wolf presence could be a factor that limits coyote abundance. However, wolves also provide food subsidies to coyotes in the form of ungulate carrion, so the net effect of wolves on coyote populations is unknown. In northern ecosystems, coyote populations fluctuate along with changes in abundance of their primary prey: snowshoe hares and voles.

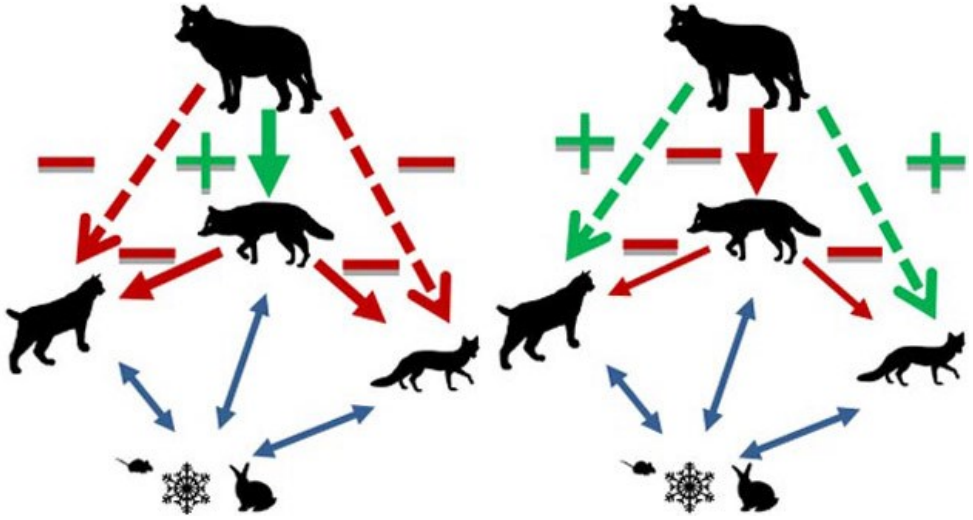


Figure 5. Hypothesis A (above left): Wolves benefit coyotes by providing carrion; coyotes limit smaller predators, thus wolves indirectly limit fox and lynx.
Hypothesis B (above right): Wolves limit coyotes, which reduces negative effects of coyotes on smaller predators. Thus, wolves indirectly benefit fox and lynx.

Population cycles of coyote prey could influence the degree that coyotes scavenge from wolves, which might directly affect coyote survival. Meanwhile, competition between coyotes and other species is thought to be influenced by habitat characteristics, such as snow depth, hardness, and vegetation, which are also changing in response to our changing climate.

Research Techniques

Researchers from the Institute of Arctic Biology at the University of Alaska Fairbanks initiated a study in the summer of 2012 to answer these questions. The study continues today as a collaborative research effort between the University of Washington and Denali National Park and Preserve.

The goal of this study is to assess how wolf activity, prey availability, and habitat (vegetation and snow characteristics) affect the dynamics of mesopredator release and the resulting cascading effects on the mesocarnivore community. These questions are addressed by putting GPS collars on coyotes, conducting winter track surveys and snow depth measurements, collecting carnivore scats, putting out motion-sensitive cameras at wolf kills, and assessing prey abundance.

Carnivore scats (feces) are analyzed to assess diets and to determine the number of individual animals in the area through DNA identification (see image to the left).

Prey populations are estimated by counting fecal pellets of hares and by live-trapping studies of voles and other small rodents.

The results of this study will enhance scientific understanding of factors that determine the strength of mesopredator release, while providing important baseline information about the mesocarnivore community in Denali. Evaluating the response of the mesocarnivore community to changes in their environment will provide critical insights as the pace of climate change increases.

Outreach

TALKS

- Micro-Update on Mesocarnivore Populations to JV bus drivers – Kaija Klauder
- "Individual Identification of Gray Wolves Canis lupus from Trail Camera Photos" – Brown Bag Presentation – Kaija Klauder
- Denali Education Center Community Series: June 28, 2016 – Bridget Borg
- NASA AboVE interview July 2016, https://blogs.nasa.gov/earthexpeditions/2016/07/12/counting-sheep-the-driving-force-of-denali

OUTREACH

- One-day field based learning expedition with Mat-SU Valley students for Intensives, September 2016 – Bridget Borg and Kaija Klauder
- MSLC staff training June 3, 2016 – Bridget Borg
- Denali Education Center Community Series: June 28, 2016

MEDIA COVERAGE

- KUAC Radio Interview, May 2016, Bridget Borg: http://www.alaskapublic.org/2016/08/03/denali-east-fork-wolf-pack-status-currently-unknown/
- https://www.nrdc.org/experts/zack-strong/bears-wolves-and-invisible-lines
- https://blogs.nasa.gov/earthexpeditions/2016/07/12/counting-sheep-the-driving-force-of-denali/
- http://www.washington.edu/news/2016/04/28/hunting-wolves-near-denali-yellowstone-cuts-wolf-sightings-in-half/

PUBLICATIONS

- Barber-Meyer, Shannon M., Mech, L. David, Newton, Wesley E. and Borg, Bridget L. Differential wolf-pack-size persistence and the role of risk when hunting dangerous prey. 2016. Behaviour, (153): 1473-1487. https://doi.org/10.1163/1568539X-00003391
- Borg B.L., Arthur, S.M., Bromen, N.A., Cassidy, K.A., McIntyre, R., Smith, D.W., and L.R. Prugh. 2016 Implications of Harvest on the Boundaries of Protected Areas for Large Carnivore Viewing Opportunities. PLoS ONE 11(4): e0153808. https://doi.org/10.1371/journal.pone.0153808
- Sazatornil, V., Rodríguez, A., Klaczek, M., Ahmadi, M., Álvares, F., Arthur, S., Blanco, J.C., Borg, B.L., Cluff, D., Cortés, Y., García, E.J., Geffen, E., Habib, B., Iliopoulos, Y., Kaboli, M., Krofel, M., Llaneza, L., Marucco, F., Oakleaf, J.K., Person, D.K., Potočnik, H., Ražen, N., Rio-Maior, H., Sand, H., Unger, D., Wabakken, P., and J.V. López-Bao, The role of human-related risk in breeding site selection by wolves. September 2016. Biological Conservation (201): 103-110. ISSN 0006-3207, https://

Members of the Riley Creek pack at a kill site / *NPS Photo*