



Vital Signs Monitoring of Wolf (*Canis Lupus*) Distribution and Abundance in Denali National Park and Preserve, Central Alaska Network

2013–2015 Report

Natural Resource Data Series NPS/DENA/NRDS—2019/1231



ON THE COVER

A wolf crosses a river in Denali National Park and Preserve
NPS Photo / Jacob Gaposchkin

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Executive Summary

We monitored wolf packs in Denali National Park and Preserve from 2013 to 2015 in accordance with protocols established as part of the Central Alaska Network Inventory and Monitoring Program. From 2013 to 2015, we captured and radio-collared 36 wolves including 25 previously un-collared wolves and 11 re-collared wolves. We monitored 10 to 12 packs each season (spring and fall). The total numbers of wolves in monitored packs ranged from 49 in spring 2013 to 67 in fall 2013. Mean pack size varied from 4.3 (spring 2015) to 6.7 (fall 2013). A total of 21 collared wolves died from 2013 to 2015; 5 died from human harvest (24%), 16 died from natural causes including starvation and intraspecific strife (76%). The number of wolf pups that were recruited to all packs monitored within the study area ranged from 29 to 48. For packs that denned, an average of seven, four, and eight pups per pack were recruited into the population in 2013, 2014 and 2015 respectively.

Introduction

Wolves are one of six keystone large mammal species in interior Alaska, along with grizzly bears (*Ursus arctos*), black bears (*Ursus americanus*), moose (*Alces alces*), caribou (*Rangifer tarandus*), and Dall's sheep (*Ovis dalli*). Wolves are of great importance to people from both consumptive and non-consumptive viewpoints, and to the ecosystem as a whole. As a top predator, wolves may play a key role in influencing ungulate populations, and as a result may influence vegetation patterns and promote species diversity (Miller et al. 2001, Ripple and Beschta 2003). Wolves occur in all three parks of the Central Alaska Monitoring Network (CAKN) and wolves are specifically identified in the enabling legislation and management objectives of each CAKN park (U. S. Congress 1980).

This report summarizes efforts to monitor wolves (*Canis lupus*) in Denali National Park and Preserve (DENA), Alaska, from 2013 to 2015. While the primary objective of monitoring is to track the distribution and abundance of wolves, a variety of additional data is obtained in the monitoring process. This information is likely to have great value for wildlife management and research. The body of data on wolf populations in Alaska parks is of great value in developing scientific models of predator/prey systems. The effects of wolves on ungulate populations may be important determinants of ungulate availability for subsistence harvest on National Park Service (NPS) park and preserve lands in Alaska, and harvest by the general public on NPS preserve lands (NPS 2003). When intensive wolf harvest or wolf control take place near parks, data on the movement patterns of wolf packs with territories near park boundaries is vital to determine whether they are being significantly impacted by activities outside of the parks. Data on the genetic, morphological, 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. In heavily visited portions of the parks, managers want to know the locations of active wolf dens and rendezvous sites (pup rearing areas) so that they can be protected from disturbance. Data obtained from wolf monitoring are used to assist with wolf den site protection and other aspects of the Denali Wolf-Human Conflict Management Plan (NPS 2007).

The following measurable objectives for the wolf monitoring project were identified as part of the CAKN inventory and Monitoring Program protocol (Meier et al. 2009).

- Locate non-radio-collared wolf packs residing on Park and Preserve lands by aerial snow tracking.
- 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 morphological measurements from captured wolves.
- Obtain genotypic data (mitochondrial and microsatellite DNA) from captured wolves.
- Obtain immunological (disease exposure) data from captured wolves.
- Determine pack size for each collared pack in fall (early winter) and spring (late winter).
- Define the mosaic of wolf home ranges (population area) for estimating wolf densities.

- Perform annual capture efforts to maintain coverage of radio collars in the population.
- Detect pack extinction and pack formation events in the population.
- Detect changes in wolf density over time.
- Detect changes in wolf pack sizes over time.
- Detect changes in wolf home ranges over time.
- Detect changes in the morphological, immunological, and genetic makeup of the wolf population over time.
- 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.

Parkwide monitoring of wolves in DENA was initiated by Resource Management Ranger John Dalle-Molle in 1986, with principal investigators L. David Mech and Layne Adams. Field work between 1986 and 1994 was performed by John Burch and Tom Meier. From 1995 through 2002, Layne Adams, now with U.S. Geological Survey (USGS), conducted wolf monitoring efforts. From 2003 to 2012, John Burch and Tom Meier conducted the field work and Tom oversaw the project management. Following Tom Meier's death in August of 2012, Bridget Borg, John Burch and Grant Hilderbrand jointly managed the wolf project until late 2013. Steve Arthur oversaw the program from late 2013 to 2015. Bridget Borg has managed the wolf project and conducted field work since late 2015.

Methods

This report spans the calendar years 2013-2015 (January-December). Prior Denali National Park wolf reporting presented the number of wolves captured, mortalities and reproduction in a biological year format as May 1, year(t) to April 30, year(t+1). However, pack territory estimates and maps were produced using data from April 1, year(t) to March 31, year(t+1) in order to create territory maps that would be available to staff and visitors before the end of May.

As previously, wolf pack territory maps in this report are derived from data on wolf locations from April 1, year(t) to March 31, year(t+1). Annual captures and mortalities and reproduction are presented by calendar year. Reproduction data (denning and recruitment) occur once a year and are consistent between biological and calendar year reporting periods, allowing for comparison with previous data.

Collaring

Methods for aerial capture and collaring of wolves followed 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 involved aerial capture via helicopter darting 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 were gathered from captured wolves.

Both conventional Very High Frequency (VHF) and GPS collars (Telonics, Mesa, AZ) were deployed on wolves from 2013 to 2015. GPS collars obtained one to eight locations each day and stored the location coordinates within the collar. Data from GPS collars was uploaded at defined intervals (three to five days) through the ARGOS or Iridium satellite system and was also stored on collar so that all data could be recovered when the collar was retrieved.

Population Monitoring

From 2013 to 2015, collared wolves were located approximately twice per month by aircraft, with more frequent aerial tracking flights occurring during May (to locate den sites), September (to obtain pup counts), during fall and spring capture operations, and from November through December and February through April to obtain early and late winter census data. Pack counts obtained from aerial tracking flights were used to obtain mean pack size and population estimates. Population estimates for early winter (October-November) and late winter (March-April) were obtained as the sum of the pack counts for all packs monitored (or tracked) within the study area during that time period. Dispersing or lone wolves were not included in population size or density estimates.

Pack Territory and Population Area Estimation

Wolf pack territory sizes and extent were estimated using 100% minimum convex polygons (MCPs). MCPs are essentially a “connect the dots” method for estimating home range sizes. For this analysis, we combined GPS and VHF wolf location data from all collared wolves within each pack over the

biological year April 1, year(t) to March 30, year(t+1). We removed wolf locations that represented extraterritorial forays or pre-dispersal movements for the analysis of pack territory MCPs.

We aggregated all wolf pack territory polygons within the study region to obtain a population area estimate (Burch et al. 2005). Occasionally the aggregation resulted in population area polygons that included large areas not covered by any wolf pack territory included in our data. In these instances, manual edits were made to the aggregated population area polygon to remove areas not reasonably used by wolf packs in the population monitored (Burch et al 2005, Meier et al 2009). Population density estimates were derived as the total number of wolves monitored divided by population area and converted to wolves per 1000 square kilometers:

$$Density = \# \text{ wolves in population} \times \frac{1000}{Population \text{ area in } km^2}$$

Wolf population estimates for the entire study region within DENA were derived by applying the population density estimate to the park study area as described in Adams et al 2010 (17,270 km²):

$$Estimated \# \text{ Wolves in Park Study Area} = Density \times \frac{17270}{1000}$$

Mortality

Wolf mortalities were noted during aerial tracking and observation and through weekly GPS data checks. Mortality data was collected on the Denali Wolf Mortality Record form (Meier et al. 2009). We attempted to recover all collars and determine cause of death for every collared individual. Cause of death was determined in the field through a field necropsy or external examination or carcasses were brought to the ADF&G for necropsy to determine cause of death. When the carcass was consumed or decomposed to the point where cause of death was inconclusive, the cause of death was recorded as “unknown natural” unless there was significant reason to conclude that there was an anthropogenic cause of mortality.

Collared wolves that died as a result of hunting or trapping were either reported directly to biologists by the harvester or by the Alaska Department of Fish and Game (ADF&G). Hunters and trappers are required by law to seal furbearers (including wolves) by an authorized ADF&G representative within 30 days after the trapping season has closed in the unit where the fur was taken.

Reproduction

Den and rendezvous locations, number and color of pups were recorded during aerial tracking flights. 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.

Closures for Wolf Den Site and Rendezvous Sites

Data from the vital signs monitoring protocol were used to annually identify denning locations and establish closures around den sites in areas frequented by park visitors as per the DENA wolf management policy (Meier et al. 2009).

Results

Collaring

In 2013, capture operations occurred on March 2-4, March 16 and December 18. We captured and collared 10 wolves: eight were previously un-collared wolves and two wolves were captured to replace aging collars. In 2014, capture operations occurred on March 3, 4, 6, and November 4. A total of nine wolves were captured: six were previously un-collared wolves and three wolves were captured to replace aging collars. In 2015, wolf capture operations occurred on March 10-15 and October 7 and 8. A total of 17 captures occurred: 11 captures were of previously un-collared wolves, two captures were to replace aging collars, and four captures were to replace accelerometer collars that were scheduled to drop in mid-October. These four wolves were re-collared with long term collars as they appeared to be stable members within the packs and, in one case, a founding member of a new pack.

Population Monitoring

The number of packs monitored from 2013 to 2015 in the DENA study area ranged from 10 to 12 (Table 1). The number of wolves monitored in the packs ranged from 49 (in spring 2013) to 67 (in fall 2013). The spring population size estimate for the study area ranged from 48 wolves in spring 2015 to 55 wolves in spring 2013. The fall population size estimate for the study area ranged from 54 wolves in 2014 to 75 wolves in 2013.

Pack Territory and Population Area Estimation

Population area estimates from 2013 to 2014 ranged from 15,473 km² in 2013 to 18,820 km² in 2015 (Table 1).

Table 1. Bi-Annual Pack Counts, Size, Area, Density and Population Estimates, Denali National Park 2013-2015.

YEAR	SEASON	NUMBER OF PACKS MONITORED	TOTAL WOLVES IN PACKS MONITORED	MEAN PACK SIZE	COMBINED AREA OF MONITORED PACKS (KM ²)	ESTIMATED DENSITY: WOLVES / 1000 KM ²	POPULATION ESTIMATE INSIDE THE PARK
2013	Spring	11	49	4.5	15,473	3.17	55
2013.5	Fall	10	67	6.7	15,473	4.33	75
2014	Spring	10	51	5.1	17,640	2.89	50
2014.5	Fall	11	55	5.0	17,640	3.12	54
2015	Spring	12	52	4.3	18,820	2.76	48
2015.5	Fall	11	61	5.5	18,820	3.24	56

Reproduction and Mortality

The number of wolf pups that were recruited to all packs monitored within the study area ranged from 29 to 48 (Table 2). For packs that denned, an average of seven, four, and eight pups per pack were recruited into the population in 2013, 2014 and 2015 respectively. We recorded six mortalities

of collared wolves in both 2013 and 2014 and nine mortalities in 2015. In 2013, 33% (2 out of 6) mortalities were human-caused, 17% (1 out of 6) of mortalities were human-caused in 2014, and 22% (2 out of 9) of mortalities were human caused in 2015. All human-caused sources of mortality were from hunting, trapping or snaring. No capture- or traffic-related mortalities were recorded.

Table 2. Reproduction and Mortality for Wolf Packs for Denali National Park and Preserve, 2013-2015. Total row for denned column indicates the number of successful denning over the number of packs for which denning information was present.

Area	PACK	REPRODUCTION 2013		REPRODUCTION 2014		REPRODUCTION 2015		ADULT MORTALITY 2013			ADULT MORTALITY 2014			ADULT MORTALITY 2015		
		Denned	Fall Pup Count	Denned	Fall Pup Count	Denned	Fall Pup Count	Natural Mortality	Human-Caused Mortality	Description	Natural Mortality	Human-Caused Mortality	Description	Natural Mortality	Human-Caused Mortality	Description
Within Study Area	Bearpaw	Yes	Suspected Failure	N/A	N/A	Yes	14	2	0	2 natural	N/A	N/A	–	N/A	N/A	–
	East Fork	Yes	6	Yes	6	No	N/A	N/A	N/A	–	N/A	N/A	–	2	2	2 natural, 2 harvested*
	Grant Creek	Yes	10	Yes	4	Yes	4	N/A	1	1 harvested*	1	0	1 natural unknown	N/A	N/A	–
	Hot Slough	NP/NM	NP/NM	NP/NM	NP/NM	Yes	Suspected Failure	NP/NM	NP/NM	–	NP/NM	NP/NM	–	N/A	N/A	–
	Iron Creek East	Yes	4	Yes	Known Failure	N/A	N/A	N/A	N/A	–	2	0	1 drowned, 1 starved	2	0	1 natural unknown, 1 killed by wolves
	Iron Creek West	Yes	8	Yes	2	Yes	14	N/A	N/A	–	N/A	N/A	–	N/A	N/A	–
	John Hansen	Yes	12	Yes	6	No	N/A	–	–	–	0	1	1 harvested*	N/A	N/A	–
	McKinley Slough	N/A	N/A	No	N/A	N/A	N/A	N/A	N/A	–	1	0	1 unknown	N/A	N/A	–
	Myrtle	NP/NM	NP/NM	NP/NM	NP/NM	Yes	6	N/A	N/A	–	N/A	N/A	–	N/A	N/A	–
Outside of Study Area	Riley Creek	NP/NM	NP/NM	Yes	8	Yes	10	NP/NM	NP/NM	–	N/A	N/A	–	N/A	N/A	–
	Somber	No	N/A	N/A	N/A	No	N/A	2	0	2 unknown	N/A	N/A	–	1	0	1 killed by wolves
	Nenana River	N/A	N/A	Yes	3	Yes	Suspected Failure	0	1	1 harvested*	N/A	N/A	–	1	0	1 starved
	Toklat Springs	N/A	N/A	No	N/A	N/A	N/A	N/A	N/A	–	1	0	1 killed by wolves	N/A	N/A	–
TOTALS		6/6	40	6/7	29	6/8	48	4	2	–	5	1	–	7	2	–

* Harvest can occur as shooting, trapping, or snaring.

NP/NM indicates that the pack was not present or monitored in that year.

N/A indicates that insufficient monitoring or information was available the pack.

Closures for Wolf Den Site and Rendezvous Sites

Maps of closure sites by year are provided in Appendix B.

2013

Mile 7 Wolf Closure

The Mile 7 Wolf Closure was implemented on April 15, 2013 as per policy to close wolf denning areas used in the last two years until denning activity for the current year is determined. After it was confirmed that the wolves did not use this area for denning, the closure was opened on June 10, 2013.

Teklanika Wolf Closure

The Teklanika Wolf Closure was implemented on April 23, 2013. The area closed encompasses areas south of the Teklanika bridge and along Igloo Creek. After it was confirmed that no wolves denned in this location, the closure was opened on May 29, 2013.

East Fork Wolf Closure

The East Fork Wolf Closure was implemented on May 29, 2013 as per policy to close wolf denning areas used in the last two years until denning activity for the current year is determined. Wolf denning activity was observed at the time of the closure. The area closed encompassed an area of the East Fork Toklat River upstream from the bridge, adjoining the permanent Sable closure. Once the park road closed at Teklanika and the wolves were frequently observed far from the den location, the closure was opened on September 18, 2013.

2014

Mile 7 Wolf Closure

The Mile 7 Wolf Closure was implemented on April 21, 2014 as per policy to close wolf denning areas used in the last two years until denning activity for the current year is determined. Wolves denned in this location in 2012 but not 2013. After it was confirmed that the wolves moved away from the den location, the closure was opened on September 4, 2014.

East Fork Wolf Closure

The East Fork Wolf Closure was implemented on May 21, 2014 as per policy to close wolf denning areas used in the last two years until denning activity for the current year is determined. Wolves denned in this location in 2013. The area closed encompassed an area of the East Fork Toklat River upstream from the bridge, adjoining the permanent Sable closure. After the wolves moved away from the location, the closure was opened on September 18, 2014.

2015

Mile 7 Wolf Closure

The Mile 7 Wolf Closure was implemented on April 15, 2015 as per policy to close wolf denning areas used in the last two years until denning activity for the current year is determined. Wolves denned in this location in 2014 but not 2013. After it was confirmed that the wolves moved to a rendezvous site south of the den, the closure was opened on August 7, 2015.

East Fork Wolf Closure

The East Fork Wolf Closure was implemented on April 15, 2015 as per policy to close wolf denning areas used in the last two years until denning activity for the current year is determined. Wolves denned in this location in 2013 and 2014. The area closed encompassed an area of the East Fork Toklat River upstream from the bridge, adjoining the permanent Sable 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 September 22, 2015.

Discussion

We continued to have successful, safe and efficient capture operations in the study area. Our aerial capture protocols have resulted in the highest level of safety for the pilots, wildlife biologist and animals involved. No capture related wolf mortalities have occurred since 2008.

Density estimates are highly dependent on the number of re-locations and comparisons of densities based on relocations of collared wolves and therefore comparisons of densities are unlikely to be very meaningful (Schmidt et al. 2017). For continuity of reporting, we continue to present density estimates but caution against their interpretation as a metric of inter-annual variation of the wolf population.

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Appendix A: Wolf Territory Maps

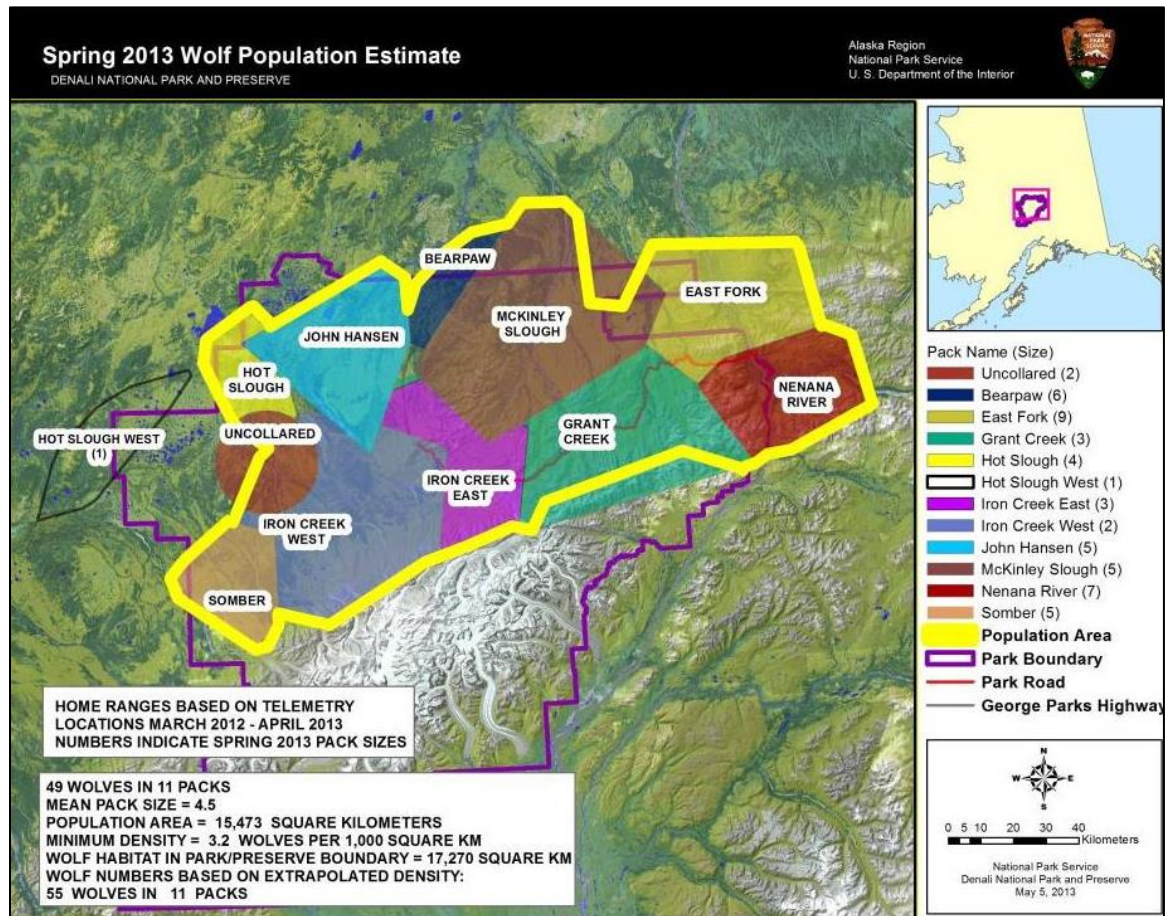


Figure 1. Wolf pack territories and population estimate for Denali National Park and Preserve, 2013.

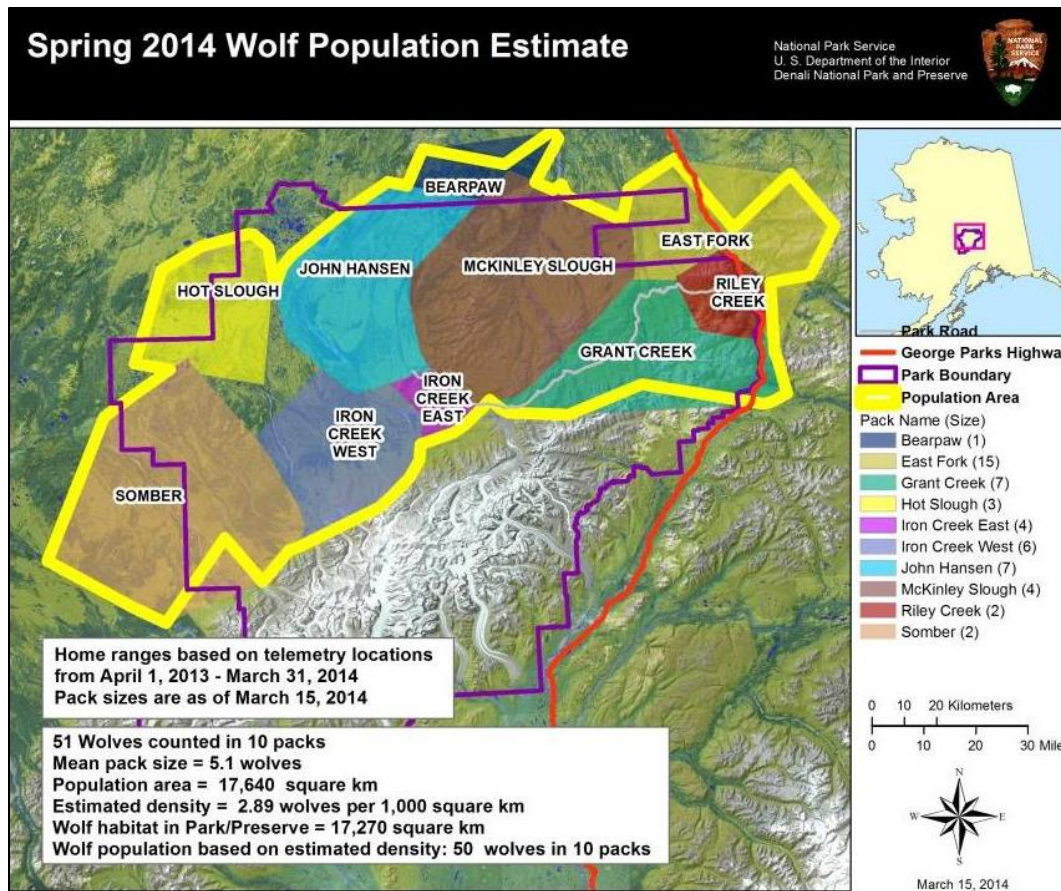


Figure 2. Wolf pack territories and population estimate for Denali National Park and Preserve, 2014.

Spring 2015 Wolf Population Estimate

National Park Service
U. S. Department of the Interior
Denali National Park and Preserve

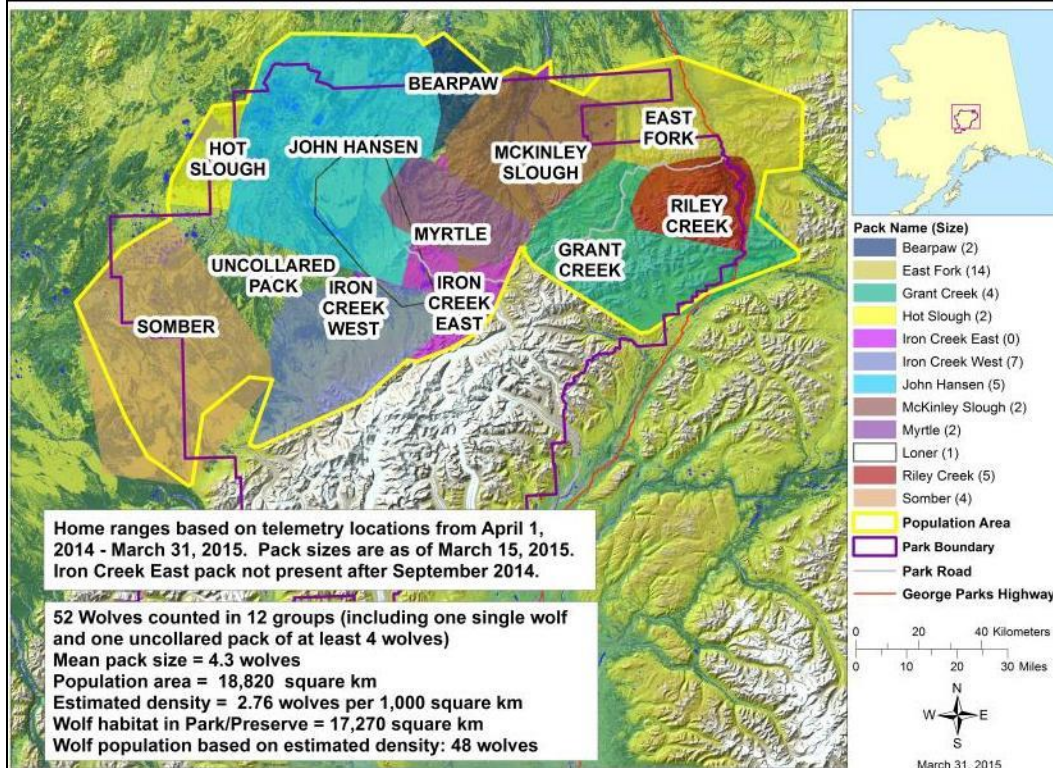


Figure 3. Wolf pack territories and population estimate for Denali National Park and Preserve, 2015.

Appendix B: Wolf Den and Rendezvous Site Closure Maps

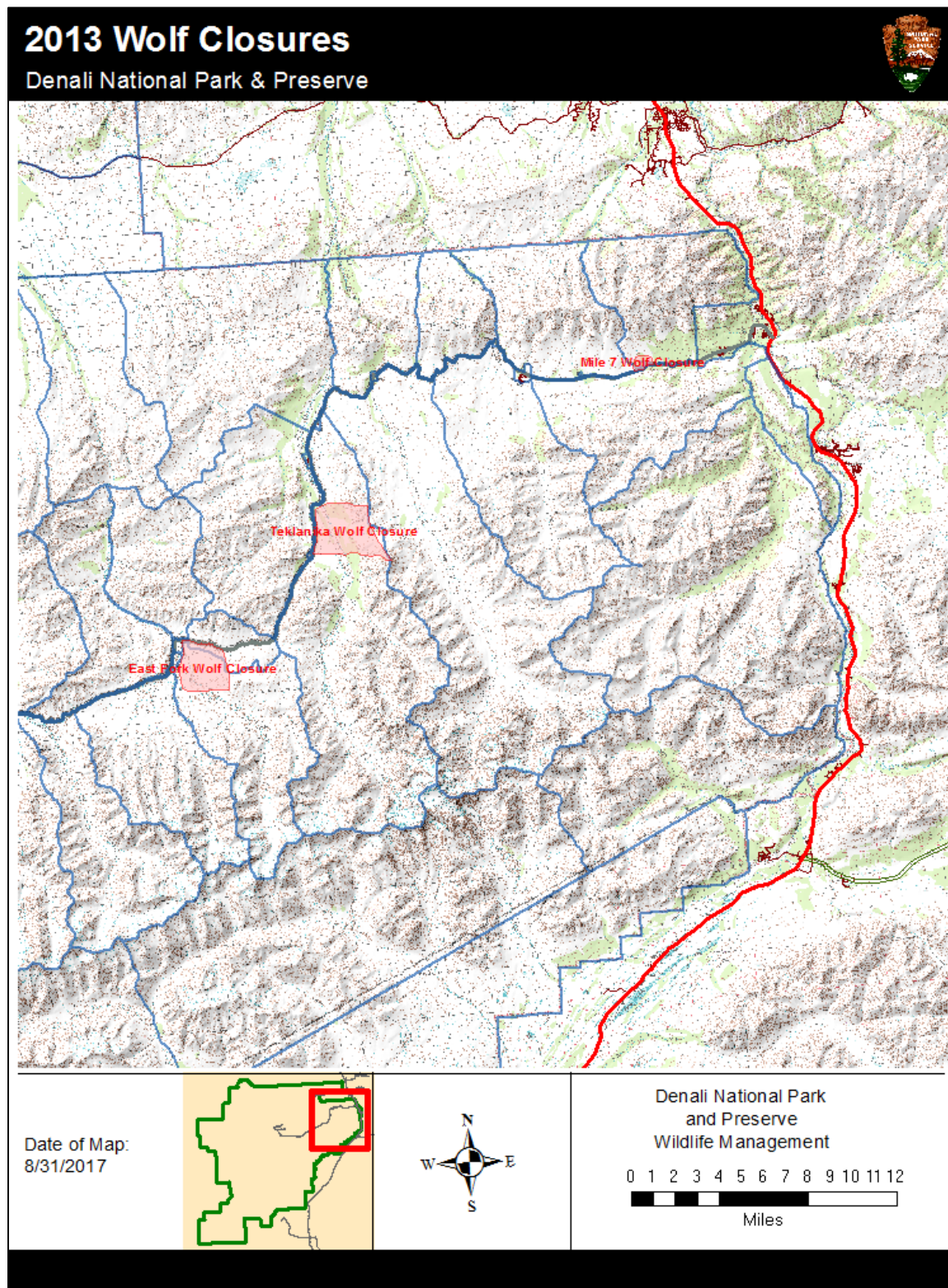


Figure 4. Wolf closures for Denali National Park and Preserve, 2013.

2014 Wolf Closures

Denali National Park & Preserve

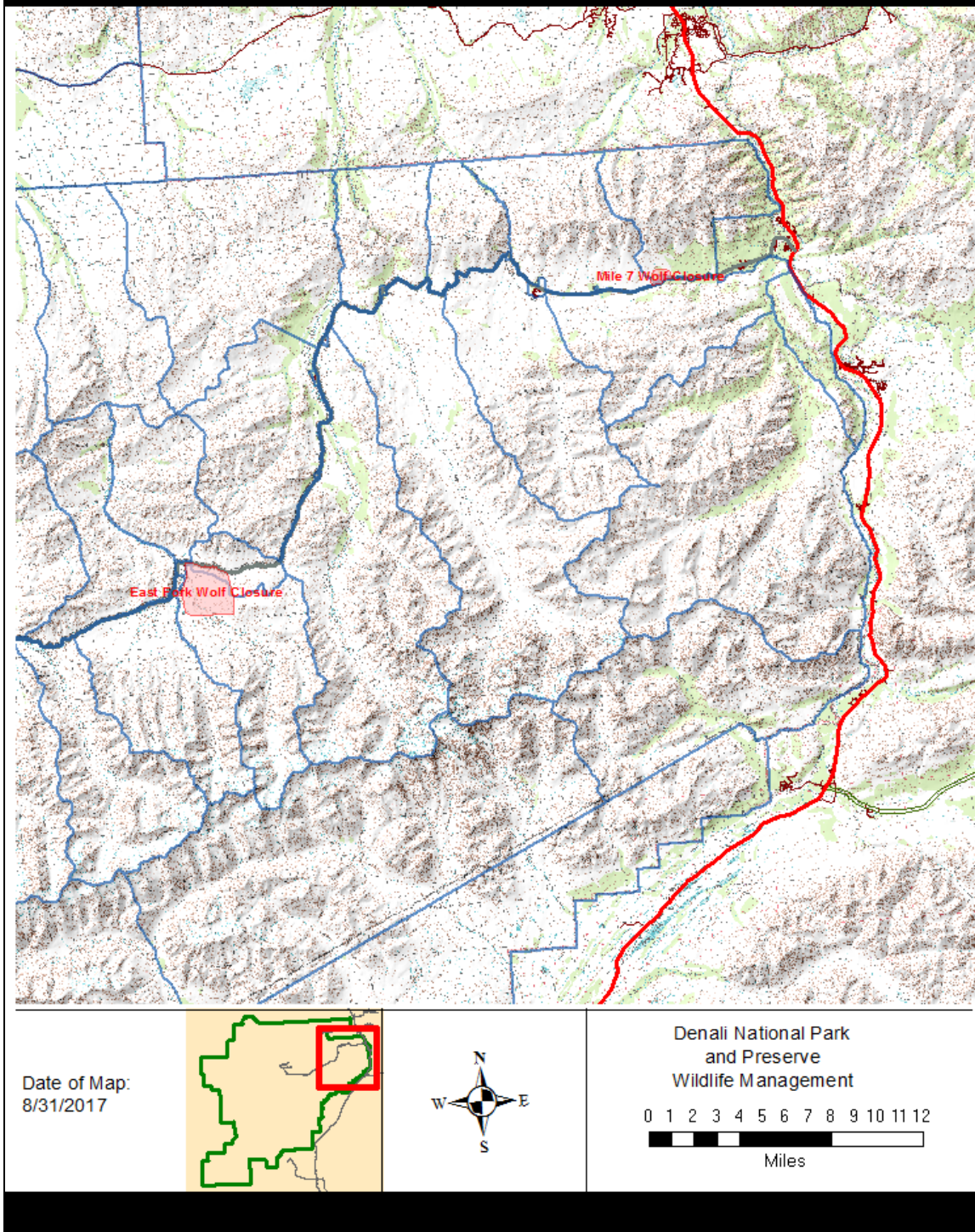


Figure 5. Wolf closures for Denali National Park and Preserve, 2014.

2015 Wolf Closures

Denali National Park & Preserve

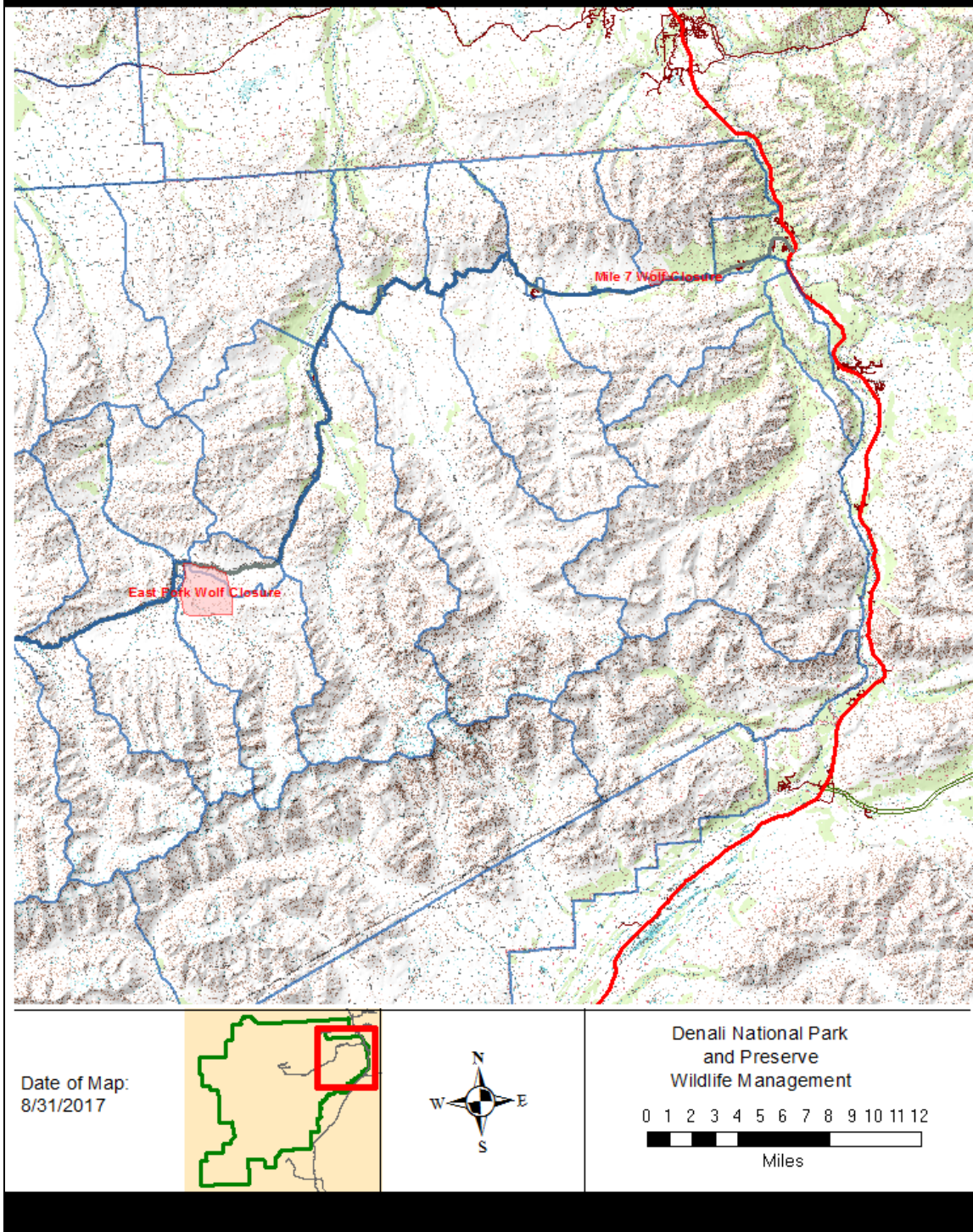


Figure 6. Wolf closures for Denali National Park and Preserve, 2015.

Appendix C: Wolf Pack Narratives

Pack Narratives: 2013-2015

NOTE: The pack narratives below begin at the start of calendar year 2013. Because previously published 2012 report was organized by biological year, it included some information for packs through spring 2013. This report will start in January 2013 and provide updates through fall 2015. Updates are done in the spring and fall of each calendar year. Wolf identification numbers are created as follows: first two digits refer to the year they were first collared, second two digits are assigned sequentially to wolves collared for the first time that year, the first letter indicates the color of the wolf (G-gray, B-black) and the second letter indicates the sex (F-female, M-male). Thus 0811GM is a gray male wolf that was the 11th wolf collared in 2008.

Eastern Packs

East Fork

2013

At nine members in spring 2013, the East Fork pack was the largest pack in the eastern region of the park and occupied a territory in the north eastern corner of the park, traveling frequently in and out of the park boundaries. By the end of March 2013, the East Fork pack numbered eight wolves (three black and five gray). It is unknown if the overwinter decrease was due to dispersal, natural mortality or harvest.

Both 0618GF and 1202BF appeared to attend the same den site during the summer of 2013 and we confirmed use of at least one den and one rendezvous site located outside of the park over the summer. By late September 2013, at least four pups (two gray, two black) were confirmed in the East Fork pack. However, by November 2013, a total of 20 wolves were seen traveling with 0618GF. It is unknown if this increase in pack size was due to a second litter of pups in the pack that was previously undetected or if other wolves joined the pack.

2014

1202BF had not been seen or heard with 0618GF since late September and by spring 2014 1202BF had joined with an un-collared black male wolf and formed the Riley Creek pack. The pair was seen several times in May at probable den site along Riley Creek, but started using a den site above Hines Creek in the beginning of June. The Hines Creek den site is the same one that was used by the Nenana River pack from 2009 to 2012 (see Riley Creek pack narrative).

One young male wolf from the East Fork pack, 1308GM, collared in December 2013, dispersed over 200 miles from Denali starting in May 2014, eventually settling down in Yukon-Charley National Preserve. Details of this trip were posted on the Murie Science and Learning Center's Research Highlights web site at: <http://www.nps.gov/articles/wolf-dispersal.htm>.

In March 2014, a 10-month pup from the East Fork pack was collared with a VHF collar (1403GM). The spring 2014 pack count for was 15 wolves in the East Fork pack. In summer 2014, 0618GF was

seen using the same den site north of the park and at least three pups were seen by late summer. The fall 2014 count for the East Fork pack was 17 wolves.

2015

1403GM died during late February 2015, after becoming caught in a snare set outside the park. The wolf was able to break free from the snare's anchor wire and return to the park, but subsequently died due to blood loss caused by the snare.

In March 2015, the East Fork pack numbered 14 wolves and two additional males in the pack were collared: 1507GM and 1508GM. In May 2015, 1507GM and an un-collared female were legally shot by a hunter outside of the park near the Stampede Trail. GPS data provided by the 1507GM's collar indicated that he had spent most of the week before his death scavenging at a bait station established by a bear hunter within a mile of the location where he was shot.

In mid-July 2015, it was noted that 0618GF's collar was in mortality mode. A necropsy revealed a small puncture on her lower back, just below her spine, that had perforated a major artery, leading to internal bleeding and subsequent death. The puncture was caused by an unknown, natural cause, most likely obtained in a fight with another animal. Although speculative, the injury is reminiscent of injuries sustained by young lambs or calves when grabbed by Golden Eagle talons. 0618GF was one of the ten oldest wolves we've monitored in the park since 1986 and in spite of her age (estimated at over 10 years) she was in good condition at the time of her death.

Following the death of 0618GF, a total of four wolves have been counted with the remaining collared wolf, 1508GM. The fate of the other East Fork pack members is unknown. No other pack members or tracks of other wolves in their territory were found during several extensive aerial tracking flights during the fall of 2015.

Grant Creek

2013

The Grant Creek pack experienced a dramatic decline in numbers in 2012, from 15 members in spring 2012 to three members in spring 2013. This decline potentially resulted from the loss of two breeding females in spring 2012. By February 2013, there were only three members left in the Grant Creek pack: the collared breeding male 0811M and two other gray colored wolves.

One of 0811M's companions was captured and collared in March 2013. This newly collared female, 1301F, was estimated to be two years old at the time of capture. From capture in March 2013 to mid-April 2013, 1301GF traveled independently of 0811GM. In mid-April 2013, 1301GF was shot near Cantwell with an un-collared gray male companion.

Since April 0811GM was seen repeatedly with one gray companion. In spring 2013 0811GM and his companion were confirmed to be denning at the East Fork Aspen den. The Grant Creek pair denned at the East Fork Aspen den site in 2013 and produced five pups. The pack moved from the East Fork Aspen den to the Murie Den in July and used the Murie Den site as a rendezvous site summer 2013.

The Murie Den site is the den site where Murie observed a wolf pack in 1940 and 1941, recording information now made famous by his publication The Wolves of Mount McKinley.

The Grant Creek adults and pups were seen occasionally along the park road during the summer of 2013. In fall 2013, the Grant Creek pack numbered seven individuals, composed presumably of the breeding pair and their five pups from spring 2013.

2014

At least since 2012, the Grant Creek pack has shown a tendency to have a seasonal shift in territory. The pack has consistently denned along the park road during the summers and during winters split time between areas along the Toklat River drainages near the park road corridor and in mountainous terrain south of the Alaska Range.

The pack count remained the same in spring 2014 as fall 2013: seven individuals. A gray female in the Grant Creek pack was collared in March 2014 (1404GF). The pack denned at the East Fork Aspen den site again in 2014.

0811GM's collar indicated it was in mortality mode in late June 2014. 0811GM was found in deceased in near a small stream with no major wounds and average body condition. He was a very old wolf (over 10 years old) and it was determined that he died from unknown natural causes.

Four pups were observed near the Aspen den site in early to mid-June, but they appeared smaller than other pups the same age in other packs. By late June/early July only two pups were observed during aerial tracking and from wolf sightings along the park road. The fall 2014 pack count was four wolves and the count remained the same through spring 2015.

2015

In March 2015, a two-year old gray male (1501GM) was collared from the Grant Creek pack. 1404GF was near the East Fork Aspen den by late May 2015 and in late August seven pups were confirmed. By September only two pups were seen with the two collared adults. Two additional un-collared wolves were also seen with the pack in fall 2015 bringing the pack count for fall 2015 to six individuals.

McKinley Slough

2013

The McKinley Slough pack experienced a dramatic decline from 2012 to 2013, dropping from 15 members in spring 2012 to only five members in fall 2012 and spring 2013. Similar to Grant Creek, this decline in pack size may be a result of the loss of a breeding female, six year old 0702GF, who died of unknown natural causes three miles southeast of Diamond in July 2012. Wolf 1211GF, a four-year old female was the only collared member of McKinley Slough pack from July 2012 to March 2013. She was seen with five other wolves in spring 2013 and one of her companions 1306GM, was collared in March 2013. 1306GM was collared on Chitsia Mountain on March 4, 2013, weighing in at 116 lbs. 1306GM's general body condition was excellent, but he had no

apparent testes and a short and deformed penis perhaps from a birth defect or injury. No other abnormalities were observed.

2014 and 2015

There was no clear evidence that this pack successfully denned or raised pups in 2013, 2014 or 2015. The collared male, 1306GM, is still with the pack, as is a gray female, 1402GF, that was collared as his companion in March 2014. We hypothesize that the lack of successful recruitment in this pack may be attributed to the dominant male's inability to reproduce due to the deformity in his reproductive organs. The fall 2013 and spring 2014 count for this pack was four individuals and only the two collared wolves (1306GM and 1402GF) have been seen in this pack since fall 2014. The fall 2014, spring 2015 and fall 2015 count has remained at two individuals.

Myrtle

2015

In March 2015, we located tracks of an un-collared pair of wolves near VABM Myrtle. Both wolves were subsequently collared: 1503BM and 1504GF. In summer 2015, the Myrtle pair denned at the Glen Creek den, which was previously used by the Iron Creek East pack in 2012 and the McKinley Slough pack from 2005 to 2009. Two gray and one black pup were seen beginning in July 2015. Sometime in early October, it appears that an additional black adult wolf joined the Myrtle pack.

In October 2015, we re-collared 1503BM to replace an accelerometer collar that was scheduled to fall off later in the month as part of a research project on wolf movements initiated by a graduate student at the University of Santa Cruz. When we re-collared this male, we noticed several puncture wounds on head and severe swelling on his muzzle, perhaps the result of injuries sustained in a fight with another wolf. From subsequent observations of 1503BM it appeared that he was recovering from his injuries and continued to travel with the pack. The fall 2015 count for the Myrtle pack includes two black adults, one gray adult, two gray pups and one black pup for a total of six wolves.

Riley Creek

2013

The Riley Creek pack was formed by 1202BF, formerly an East Fork wolf, and a black male companion in fall 2013. 1202BF had not been seen or heard with the East Fork pack beginning since late September 2013 and by spring 2014, 1202BF had joined with an un-collared black male wolf and formed the Riley Creek pack.

2014

The pair was seen several times in May 2014 at probable den site along Riley Creek, but started using a den site above Hines Creek in the beginning of June. The Hines Creek den site is the same one that was used by the Nenana River pack from 2009 to 2012. In summer 2014, the Riley Creek pack raised four pups (two gray and 2 black), bringing the fall 2014 pack count to six members. In November 2014, the black/dark gray breeding male was collared- 1406DGM.

2015

Five wolves were still in the pack in spring 2015 including the collared breeding pair and the pack denned at the same location as in previous years and raised five pups (four black, one gray). The fall 2015 pack count included four adults and the five pups for a total of nine wolves.

Nenana River

2013

During fall and winter 2012-13 the pack primarily traveled south and east of their summer territory and were seldom within the park boundary. In spring 2013, the pack numbered seven individuals, indicating that at least one un-collared wolf dispersed or died over the winter.

The Nenana River pack was seen at several times during summer 2013 at a presumed den site outside of the park to the east. No pups were confirmed visually. On August 13, 2013, 1105GM and three other pack members were legally shot approximately nine km outside of the park by a hunter. The hides were sealed and the collar from 1105GM was turned in to the Alaska Department of Fish and Game on August 16, 2013. The hunter reported seeing a total of six pack members. There is no information on whether any of the wolves seen or shot were pups. The collared female, 0905GF, was seen alone on August 16. The fall 2013 count for Nenana River pack was nine individuals.

2014

Since fall 2012, the Nenana River pack has consistently been located east of the park boundaries and monitoring of the pack has been limited following the shift in pack territory outside of the park boundaries. In spring 2014, we counted 10 individuals with the remaining collared wolf, 0905GF. There was a suspected den site in the Yanert Valley in summer 2014 and four pups were confirmed. By November 2014, a total of 14 wolves were counted in the Nenana River pack.

2015

In January and February 2015, several flights counted a total of 22 wolves in the Nenana River pack in the Yanert Valley. In April, 0905GF was located near a den site used in 2013 but no pups were seen. In August 2015, 0905GM was found deceased near the den site. A field necropsy indicated that 0905GF was in poor condition, with no subcutaneous fat and likely died due to starvation.

Western Packs

Bearpaw

2013

Both dominant individuals in the pack died during the winter 2012-2013. The dominant female, 0415GF died of unknown natural causes near Flume Creek. The dominant male, 1206BM, a four year old, died in early winter near Chitsia and Flume Creeks due to uremic poisoning and dehydration secondary to paralysis. The cause of paralysis was undetermined. The remaining collared member, 1006BF, a two year old female has been traveling with the remaining members of the pack (presumably all pups). In March 2013, one of the pups, 1307GF was collared in the Bearpaw pack, although 1307GF subsequently dispersed northwest of the park.

2014

From fall 2013 to spring 2014, the remaining collared Bearpaw member, 1006BF, was alone. In May 2014 she was seen with a gray companion.

2015

1307GF was consistently alone near the north boundary of the park from March 2013 when she was collared, until May 2015, when her collar was located in mortality mode north of the park boundary. We have been unable to recover the collar due to its location and the cause of death for this wolf is unknown. In March 2015, the companion of 1006BF was collared- 1502GM. In May 2015 both collared Bearpaw wolves were located at the 2012 Bearpaw den site near Otter Creek. By October, at least six pups were confirmed (four gray, two black) with the collared pair for a fall 2015 count of eight in the Bearpaw pack.

Eagle Gorge

2015

In March 2015, a two-year old male wolf (1506GM) in the John Hansen pack was collared with an accelerometer collar as part of a study in collaboration with the University of Santa Cruz. Starting in April 1506GM was occasionally apart from the other collared male in the John Hansen pack (1302GM) and seen with one un-collared gray companion. Beginning in September 2015, 1506GM was consistently well south of the John Hansen territory and has localized in the Eagle Gorge-McKinley Bar- Turtle Hill area with one un-collared companion. As of fall 2015, 1506GM and his companion are considered a new pair, named Eagle Gorge.

Iron Creek West

2013

The Iron Creek West pack fell from seven wolves in fall 2012 to two wolves in spring 2013. 1001GF, originally collared as a pup in 2010 as member of Iron Creek pack, died from apparent injuries from other wolves near McLeod Creek in February 2013. The remaining collared wolf in the pack, 1208GF, was originally collared in March 2012 and traveled in the Iron Creek West Territory with one companion. Following a decrease to two members in spring 2013, the pair denned south of McLeod Lake near a glacial erratic rock pile and raised four pups for a fall pack count of six members in fall 2013.

2014

The pack count remained at six wolves in spring and fall 2014. A light gray male 1405LGM, was collared in the Iron Creek West pack in March 2014. It appeared that in 2014, the pack denned at a new den site west of upper Foraker and two pups were seen.

2015

The Iron Creek West pack was the largest pack in the park as of fall 2015 with a pack count of 15 members. By spring 2015, there were seven wolves in the Iron Creek West pack, apparently picking up an additional gray wolf over winter. In 2015, the pack denned at a den site previously used by the McLeod 2 pack in 2007. At least six pups were confirmed at the den site. A total of 15 wolves were seen in the pack by late September, bringing the fall 2015 pack count to 15 members.

John Hansen

2013

In March 2013, a new pack consisting of five wolves was located along the McKinley River near Kabena Hill. Collars were placed on the presumed dominant members of the pack, 1302GM, a two year old gray male and 1303GF a four year old gray female. Both wolves had a coat abnormality consisting of some guard hair loss, possibly follicular dysplasia (Beckmann et al, 2009) but were otherwise in good condition. The location of this pack coincided with the location of an un-collared pack of at least eight wolves that were tracked in fall 2012. This pack may be an offshoot of the former Kantishna River pack, which once held a territory in this region prior to merging with the Somber pack in 2011. Alternatively, the pack may be a remnant or related to the former Starr Lake pack or the McKinley Slough pack. In 2013, the John Hansen pack used the same den site that the former Starr Lake pack used. Pending genetic analysis could help determine if collared members of this pack are related to any of the aforementioned packs. In fall 2013, there were eight members in the John Hansen pack.

2014

In 2014, pack numbers dropped down to seven confirmed members by spring 2014. The John Hansen pack denned at a site approximately one mile northeast of the Starr Lake den site. Three pups were seen in summer 2014 and it was noted that these pups were considerably larger than the Grant Creek pups at the same time of year. In fall 2014, the John Hansen pack consisted of eight wolves, however the composition of pups to adults was never certain. In November 2014, 1303GF was legally shot by a trapper outside the park.

2015

By spring 2015, there were five pack members and an additional male (1506GM) was collared with an accelerometer collar as part of a study in collaboration with the University of Santa Cruz. Starting in April 1506GM was occasionally apart from 1302GM with one un-collared companion. Beginning in September 2015, 1506GM was consistently in the Eagle Gorge- McKinley Bar- Turtle Hill areas with one smaller, un-collared companion (presumably a female, not a pup). As of fall 2015, 1506GM and his companion are considered a new pair, named Eagle Gorge. 1302GM and two un-collared companions continued to use territory within the former John Hansen range. There was no evidence that members of the John Hansen pack denned in 2015. The fall 2015 count for the John Hansen pack noted three wolves.

Hot Slough

2013

In March 2013, three year old male 1304BM was collared in the Hot Slough pack and is suspected to be the breeding male of the pack. In addition to 1304BM and 0805GF, there were two other wolves in the Hot Slough pack in spring 2013 (a total of three gray and one black).

2014

From fall 2013 to spring 2014, there were three members in the Hot Slough pack.

2015

In early March 2015, 0805GF's collar signal indicated mortality mode. We recovered the wolf's head and collar at the base of a steep bank, which was indicative that another wolf or wolves killed 0805GF. The remaining companion with 1304BM was collared in March 2015: 1505GF. In mid-May 2015, 1505GF was found deceased near a den site southeast of Minchumina. No other wolves were seen with 1304BM by November 2015.

Iron Creek East

2013

Iron Creek East pack primarily ranged from the south end of the Kantishna Hills to Turtle Hills and denned along Glen Creek in 2012, although pups were never seen at this den site. The fall 2012 pack size was three following the death of 1106GF and 1108GM. The pack size in spring 2013 remains at three wolves. In summer 2013 the Iron Creek East pack denned at the Glen Creek den site and two pups were confirmed bringing the fall 2013 pack count to five individuals. By the end of November we noted the mortality of 1205GF, likely due to injuries sustained from other wolves.

2014

In spring 2014, there were four wolves in the pack and one 1401GM was collared in March. In May 2014, the Iron Creek pack denned at a den site near Wonder Lake and one pup was seen in July. However, the Iron Creek East pack disappeared after both collared adult wolves died in September 2014. The breeding female (1207GF) died of starvation and her mate (1401GM) subsequently dispersed eastward. He evidently drowned while crossing the Toklat River, which was swollen from recent heavy rains.

2015

In March 2015, a new pair was located and radiocollared in the range previously occupied by the Iron Creek East pack. This pair was dubbed the Myrtle pack (see Myrtle pack narrative).

Loner (poodle coat)

2015

A lone male wolf was captured and collared in March 2015 and fitted with an accelerometer collar. This wolf, 1511BM, exhibited an abnormal condition known as follicular dysplasia, also known as "poodle coat". This condition is characterized by loss of the long guard hairs from much of the wolf's body, resulting in a wooly appearance due to the dense, short underfur that remains. This wolf died approximately March 31, evidently due to starvation.

Somber (Monitored infrequently)

2013

The Somber pack territory lies mainly between the western edge of the wilderness and park boundary along the Swift Fork. In spring 2013, there were five wolves in the pack. Two collared wolves, 1109BM, a four year old male, collared in 2011 as a Somber pack member and 1210GF, a four year old female died of unknown causes in spring 2013. The mortalities were first noted in May 20, 2013.

As of September 2013, one remaining collared pack member was noted, yearling 1305GM. In fall 2013, there were still five members in the Sombra pack.

2014

Pack numbers decreased to two individuals in spring and fall 2014.

2015

In February 2015, it appeared from GPS data that the remaining wolf collared in the Sombra pack, 1305GM, was deceased. During March 2015 capture, the collar was retrieved. It had been chewed on and old tracks of wolves were all around. The cause of mortality of 1305GM is unknown, but it is probable that he was killed by other wolves. During capture in March 2015, tracks of the un-collared members in the pack were located and successfully back-tracked to the pack and two wolves were collared: 1510GF and 1509GM. The two newly collared wolves were accompanied by two additional wolves. By March 22, 1509GM was deceased and investigation of the carcass and site indicated that a large wolf fight occurred, resulting in the mortality of 1509GM. In fall 2015, 1510GF was located with at least four other wolves bringing the fall 2015 pack count to five wolves composed of two gray and three black wolves.

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