Yellowstone National Park
Yellowstone Wolf Project 2017
Wyoming, Montana, Idaho

Yellowstone Center for Resources
National Park Service
Department of the Interior

Yellowstone Wolf Project Annual Report

(NPS photo - D. Stahler)

2017

Summary

There were at least 97 wolves in 11 packs (3 breeding pairs) living primarily in Yellowstone National Park (YNP) at the end of December 2017 (figures 1 & 2; table 1). Overall, wolf numbers have fluctuated little from 2009 to 2017 (83-108 wolves) while breeding pairs (defined as an adult male and an adult female with two pups that survive through the end of the year) have typically been two to three times higher than the 2017 count. Pack size in 2017 ranged from 2 to 21, averaging 8.8 in size. Park-wide, 21 pups survived to year end, only 5 in northern Yellowstone and 16 in the interior of the park. Five packs had total litter loss and over half of the park's recorded pups were in the Wapiti Lake pack.

Wolf-Prey Relationships

Project staff detected 233 kills that were definitely, probably, or possibly made by wolves in 2017: 150 elk (64.4%), 31 bison (13.3%), 12 mule deer (5.2%), eight deer of unknown species (3.4%), seven coyotes (3.0%), three white-tailed deer (1.3%), two snowshoe hares (0.9%), one wolf (0.4%), one pronghorn (0.4%), one badger (0.4%), one moose (0.4%), one golden eagle (0.4%), one otter (0.4%), and 14 unidentified animals (6.0%). The composition of wolf-killed elk was: 24.0% calves, 5.3% yearlings, 32.0% adult females, 30.0% adult males, 4.7% adults of unknown sex, and 4.0% of unknown sex and age. Wolf predation was monitored intensively for four months of the year – one month in early winter (mid-November to mid-December), one month in late winter (March) and two months in spring-summer (May-June). The type of prey killed by wolves varies by time period, but consists primarily of elk. However, predation on other species such as bison and mule deer may be increasing.

Winter Studies

During March 2017, our "late" winter study period, air and ground teams discovered 25 ungulate carcasses fed on by wolves. Fifteen (60%) of these ungulates were killed by wolves, including 12 elk, one deer, and two unknown species. Two of the elk (17%) were calves, one (8%) was a yearling, five (42%) were adult females, three (25%) were adult males, and one (8%) was an adult of unknown sex. Wolves also fed on 10 ungulates they did not kill, six of which were bison.

During November-December 2017, our "early" winter study period, air and ground teams discovered 32 ungulate carcasses fed on by wolves. Twenty-nine (91%) of these ungulates were killed by wolves, which included 21 elk, four bison, three deer, and one unknown species. Four of the elk (19%) were calves, one (5%) was a yearling, nine (43%) were adult females, six (29%) were adult males, and one (5%) was of unknown age and sex. The wolves also fed on two bison and one elk that they did not kill.

Summer Predation

Wolf predation was assessed during May and June. This is achieved by hiking to clusters (a location other than a home site where a wolf spent 30 minutes or more) generated from satellite collars (e.g., GPS collars) to search for prey remains. Only some of the wolves in each pack wear GPS collars, and not all GPS collars are used to search for clusters. We found

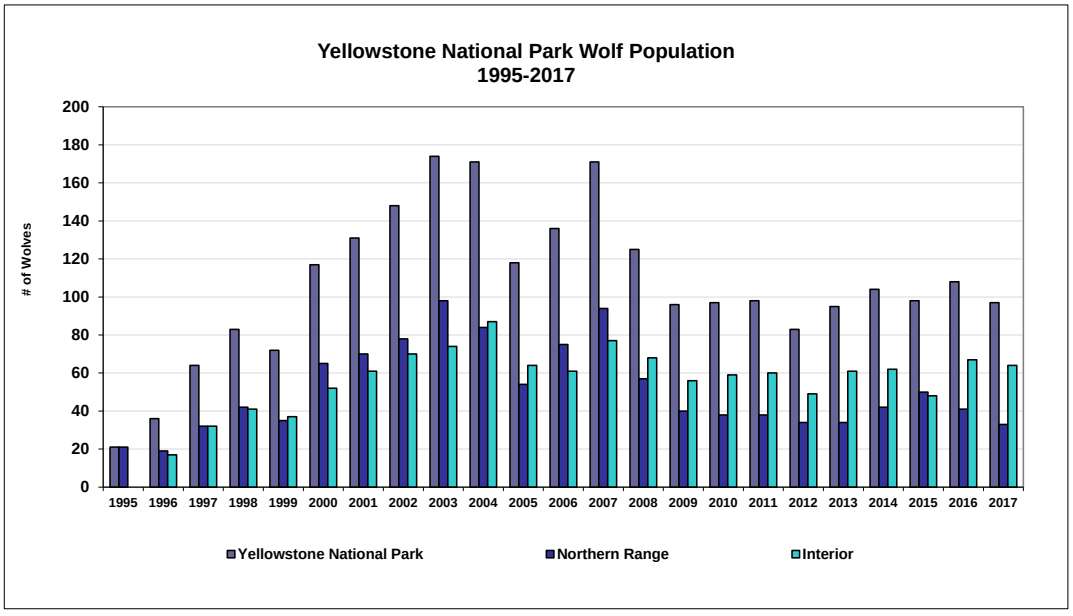


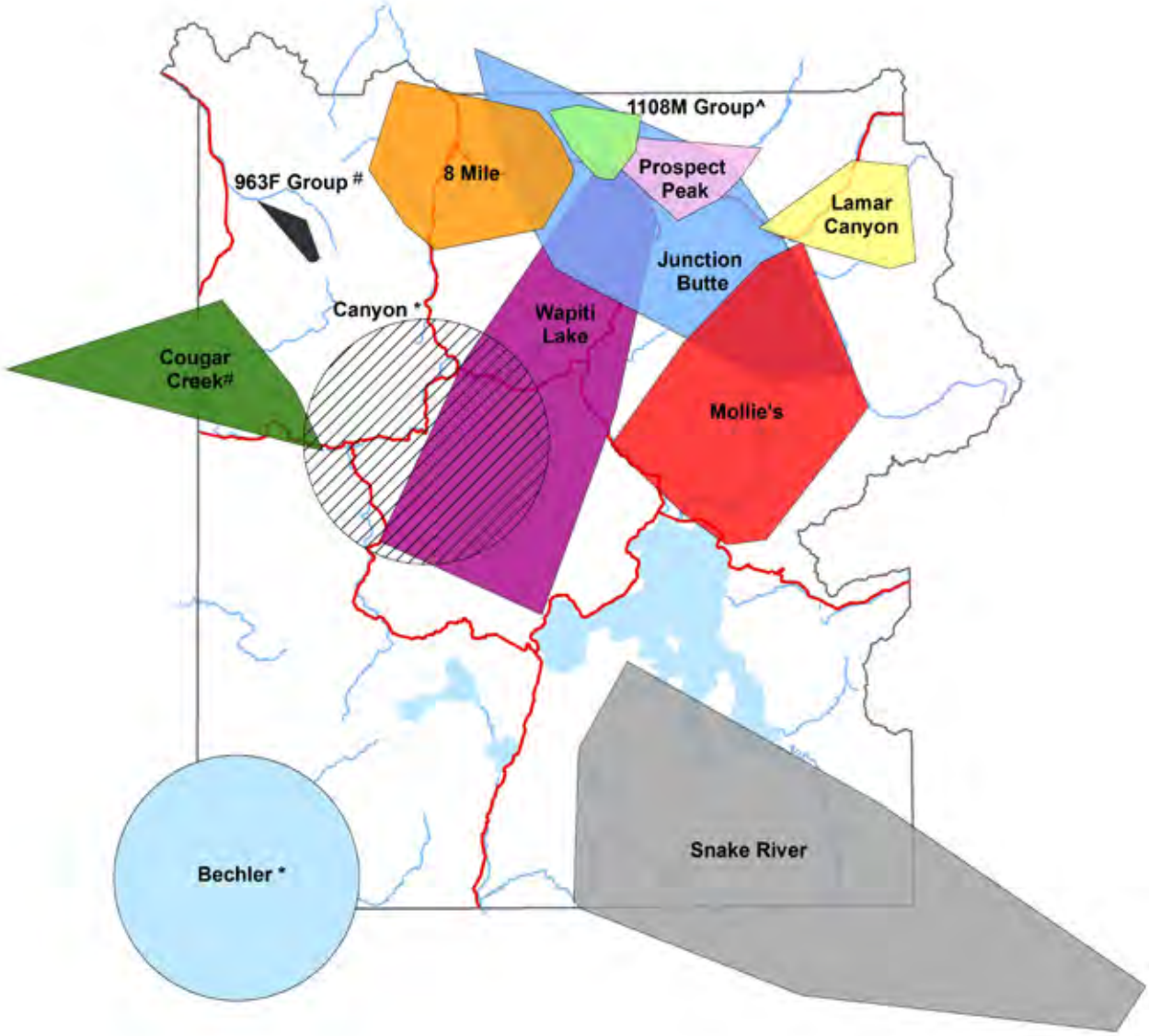
Figure 1. Yellowstone National Park early winter wolf numbers from 1995-2017.

Table 1 . Yellowstone wolf population estimate as of 12/31/17.

Yellowstone Wolf Population Estimate as of 12/31/2017	Adults	Pups	Total
Northern Range			
8 Mile	9	4	13
Junction Butte	8		8
Lamar Canyon	3		3
1108M group	5		5
Prospect Peak (no collars)	3	1	4
Northern Range Totals	**28**	**5**	**33**
Non-Northern Range			
963F group	2		2
Bechler (no collars)	8		8
Cougar Creek (no collars)	6	1	7
Mollie's	14		14
Snake River	9	3	12
Wapiti	9	12	21
Non-Northern Range Totals	**48**	**16**	**64**
YNP Total	**76**	**21**	**97**

Note: underlined packs count as breeding pair

2017 Yellowstone Wolf Pack Territories



^ Newly formed pack collared at end of 2017.
# Territory generated with <10 locations due to poor collar coverage.
* No radio collars present, unable to estimate territory size.

Table 2. Confirmed collared wolf moralities in Yellowstone National Park in 2017.

Wolf #/Sex	Age Class	Pack	Date of Death	Cause of Death
909F	old adult	8 Mile	4/10/2017	Interspecific
821F	old adult	Prospect Peak	4/29/2017	Intraspecific
1083F	old adult	Snake River	8/21/2017	Natural Unknown
949M	old adult	Lamar Canyon	8/24/2017	Disease

64 suspected kills or fresh carcasses of ungulate prey, which included 41 elk, 18 bison, one deer, one moose, one pronghorn, and two unknown species. We also found one badger and two snowshoe hares.

Mortalities

Four radio-collared wolves died in 2017 (table 2): one was killed by other wolves, one kicked and killed by an ungulate, one died of canine distemper virus (CDV), and one died of unknown natural causes (necropsy was delayed due to remoteness and exact cause of death could not be determined). All four were old adults (two were 6.5 and two were 8 years old). The wolf that died after being kicked several times by an ungulate was a female pregnant with five pups (three males, two females) that all died. They were within a week of birth. In addition, staff recorded six uncollared adult wolf deaths; all six were human-caused. Five were harvested during the wolf hunting season in Montana (one old adult, three adults, and one pup) and one was illegally shot inside park boundaries and had to be euthanized by park staff.

Disease

In mid-August the alpha male of the Lamar Canyon pack started to exhibit acute disease symptoms. Observers at first noted mucous in his eyes, weight loss, and unsteady back legs and within one week the symptoms advanced to near-complete paralysis. Lab results confirmed he died of canine distemper virus and the virus in his particular case was concentrated in the nervous system. In addition, several packs produced pups but lost the entire litter fairly early: 963F group in early May, Junction Butte in late May, Lamar Canyon in late May, and Mollie's in late June. Three of these four packs lived on the Northern Range, where previous outbreaks of CDV (1999, 2005, and 2008) have primarily affected pup survival. Moreover, the other, the Mollie's pack, also visits the Northern Range and interacts with resident wolves. We were not able to find any pup remains and so were not able to test for disease exposure but the timing of mortalities is fairly consistent with when wolves have died from CDV in past years. Mange occurred at very low levels with several wolves from the Lamar Canyon pack recovering over the spring months and by the end of the year there were no known infections.

Table 3 . Wolves captured and handled in 2017.

Wolf #/Sex	Date of Capture	Age	Color	Pack
1049F	1/16/2017	Pup	Black	8 Mile
962M	1/16/2017	Adult	Black	8 Mile
963F	1/16/2017	Adult	Gray	8 Mile
1047M	1/16/2017	Adult	Black	Prospect Peak
1048M	1/16/2017	Yearling	Black	Prospect Peak
821F	1/16/2017	Old Adult	Gray	Prospect Peak
964M	1/16/2017	Adult	Gray	Prospect Peak
1050F	1/18/2017	Pup	Black	Cougar Creek
1051M	1/18/2017	Pup	Black	Cougar Creek
1082M	1/20/2017	Adult	Black	Snake River
1083F	1/20/2017	Old Adult	Black	Snake River
1084M	1/20/2017	Pup	Black	Snake River
1090F	1/25/2017	Adult	Black	Mollie's
779F	1/25/2017	Old Adult	Black	Mollie's
890M	1/25/2017	Adult	Black	Mollie's
978F	1/25/2017	Adult	Gray	Mollie's
1014M	2/13/2017	Adult	Black	Wapiti Lake
1091F	2/13/2017	Yearling	Gray	Wapiti Lake
1107M	12/15/2017	Adult	Black	1108M Group
1108M	12/15/2017	Adult	Black	1108M Group
1104F	12/15/2017	Pup	Black	Wapiti Lake
1105M	12/15/2017	Pup	Gray	Wapiti Lake
1106M	12/15/2017	Pup	Gray	Wapiti Lake
1109F	12/16/2017	Yearling	Black	Junction Butte
907F	12/16/2017	Adult	Gray	Junction Butte
969F	12/16/2017	Adult	Gray	Junction Butte

Wolf Capture

Twenty-six wolves in eight packs were captured and collared in 2017 (table 3). Ten of these were recollars to replace old or malfunctioned transmitters. In addition to marking them, a number of measurements and biological samples were taken. Thirteen females and thirteen males were captured; three were old adults (>6 years old), 11 were adults (2-5 years old), five were yearlings, and seven were pups (< 12months).

Wolf Management & Outreach

Wolf management activities included den site closures and several hazing events. Staff continued to manage wolf viewing areas in Slough Creek, Lamar Valley, Hayden Valley, and other areas where wolves were frequently observed. Public outreach included giving 285 formal talks, participating in 65 interviews, making over 42000 visitor contacts, and giving 825 informal talks in the field.

Wyoming, Idaho, and Montana conducted wolf hunts outside of YNP and five wolves that primarily live within the boundaries of YNP were legally harvested in Montana.

Wolf Pack Summaries

8 Mile (13 wolves; 9 adults, 4 pups)

Long-time alpha female 909F's six-year leadership of the 8 Mile pack ended in April 2017 when she died after being kicked several times by an ungulate. She was within about one week of whelping five pups. One of 909F's daughters took over the alpha role and gave birth to a litter of five pups,

The 8-mile pack, two adults with a pup, do what wolves do in summer during the day—rest! NPS Photo - D. Stahler

four of which lived to the end of the year. Another daughter dispersed to form a new group in the Fan Creek/Gallatin River area (see 963F group summary). The 8 Mile pack remained one of the largest on the Northern Range and in the fall a group of mostly young males split off from the main pack (see 1108M group summary). This is the fifth group that dispersing 8 Mile wolves have joined or established in the last four years.

963F group (2 wolves; 2 adults, 0 pups)

This group began when 963F denned separate from the main 8 Mile pack in the spring. After losing her pups in early May, likely while trying to move them to another den, she shifted to the west side of the Gallatin Range and was joined by several 8 Mile pack members. Near the end of the year the pack's alpha male was harvested outside the park in Montana and the remaining wolves continued to travel back and forth over the Gallatin Mountains.

1108M group (5 wolves; 5 adults, 0 pups)

This group split off from the main 8 Mile pack in fall 2017. At least four of the five wolves are males and are likely looking to establish a new pack in the Hellroaring area. This may be possible as the Prospect Peak pack is much reduced in numbers.

Prospect Peak (4 wolves; 3 adults; 1 pup)

Pack composition for the Prospect Peak pack fluctuated in early 2017 with several males going back and forth between Junction Butte and Prospect Peak. Long-time alpha female 821F was killed by other wolves, possibly the Junction Butte pack, just a few weeks after giving birth. Likely her pups all died and her death left the pack with no working radio-collars. A younger female had five pups near Slough Creek and the area became a popular wolf-watching spot for several months. During the fall wolf hunting season in Montana the pack left the park and alpha male 966M and a gray female pup were harvested. Opportunistic sightings near the end of the year confirmed the pack still exists with four members: 964M with a nonworking collar, two adult females, and one pup.

Junction Butte (8 wolves; 8 adults, 0 pups)

After a winter of reestablishing leadership and territory, the Junction Butte pack alpha female 907F denned in a remote location. However, observers frequently observed most of the adults far away from the den and they did not appear to be bringing food to 907F or the new pups. Wolf 907F returned to the pack by late May, likely after her pups died. The actual cause of the loss is unknown but could be related to disease, starvation, or some other natural mortality. Alpha male sw763M also disappeared during this time at 11 years old. By fall it was clear the position of alpha female had switched from 907F to her sister 969F. Both females were born to the Junction Butte pack in 2013 and the trading of roles apparently occurred with very little physical dominance or tension.

Lamar Canyon (3 wolves; 3 adults, 0 pups)

Both females appeared pregnant in April 2017 and localized for approximately one month before leaving the den area. Likely all pups were lost at that time. Alpha male 949M appeared sick in mid-August and over ten days lost all coordination and died. Lab results concluded that he died of canine distemper virus. By the end of the year 926F was occasionally submitting to her daughter and their dominance roles may be changing.

Mollie's (14 wolves; 14 adults, 0 pups)

Several Mollie's females appeared pregnant in 2017 and GPS locations showed them attending a den in a traditional area near Pelican Valley. However, in late June they stopped attending the area, indicating the pups had died. Pack numbers dropped from 18 to 13 throughout the year but in December the pack gained a new, unrelated wolf of unknown origin. The Mollie's territory continued to include Pelican Valley and parts of the Mirror Plateau and Lamar Valley, with some expansion into Slough Creek and Hayden Valley by late in the year.

Wapiti Lake (21 wolves; 9 adults, 12 pups)

Both adult females denned and produced litters of five (1091F) and seven (white alpha female) pups, respectively. The pack spent the summer in Hayden Valley but have spent a significant portion of early winter on the Northern Range after the autumn elk migration left Hayden Valley devoid of elk. The pack's ability to move freely on the Northern Range is likely the result of their large pack size, which is the largest recorded since the Gibbon Meadows pack reached 25 members in 2008.

Canyon (0 wolves)

After leading the pack for nine years with alpha male 712M, the Canyon's white alpha female appeared to have difficulty keeping up with the rest of the pack in early 2017. On April 11 she was shot illegally inside the park. Park staff responded to a report of an injured wolf and after assessing that her injuries were extremely severe and fatal, decided to euthanize her. Some of the remaining pack members were seen occasionally but alpha male 712M disappeared. By summer remote cameras counted only one Canyon female wolf with a new mate, an uncollared black. The female appeared to be nursing but no pups were observed. In December the pair travelled north of YNP and both were harvested in Montana Wolf Management Unit 390. This marks the end of the nearly ten-year reign of the Canyon pack.

Cougar Creek (7 wolves; 6 adults, 1 pup)

In early 2017 the pack chewed off one new collar, one old collar, and may have chewed off a third but damaged the transmitter enough to make it untrackable. Staff set up remote cameras in traditional Cougar pack territory and a flight in early 2018 counted seven individuals, one which appeared to be a pup.

Snake River (estimated at 9 wolves, likely 6 adults, 3 pups)

The Snake River pack continued to shift east into former Yellowstone Delta pack territory. An older female, possibly the breeding female, died in August in the pack's rendezvous site. The pack traveled widely and have only one working radio-collar by the end of the year.

Bechler (estimated at 8 wolves, unknown ages)

Investigation of the pack's traditional den area showed some evidence of pups this year. The Bechler pack has no radio-collars and we rely on visitors and park staff reporting sightings and cases of howling and wolf tracks in the Bechler region. Reports were sparse in 2017 and as a result pack size was estimated.

Other wolves

Cinnabar Mountain (7 wolves; 2 adults, 5 pups) -This pack shifted their territory slightly and this year is counted in the Montana wolf population. The pack lost one pup and one adult male in the Montana wolf hunting season.

Winter Study has its rewards! Adam Fahnestock and Jack Rabe look for 8-mile wolves through early morning sun and fog. NPS Photo - R. Thomas-Kuzilik

Publications

Cassidy, K.A., L.D. Mech, D.R. MacNulty, D.R. Stahler, & D.W. Smith. 2017. Sexually dimorphic aggression indicates male gray wolves specialize in pack defense against conspecific groups. *Behavioural Processes* 136: 64-72.

Cassidy, K.A. Spring 2017. A Canine Cosmos. *International Wolf* :22-23.

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Cassidy, K.A. 15 June 2017. Male Gray Wolves Protect Family Members from Rival Packs. Inside Yellowstone. Yellowstone Forever. https://www.yellowstone.org/male-gray-wolves-protect-family-members-from-rival-packs/

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McIntyre, R.T., J.B. Theberge, M.T. Theberge, & D.W. Smith. 2017. Behavioral and ecological implications of seasonal variation in the frequency of daytime howling by Yellowstone wolves. *Journal of Mammalogy* 98: 827-834.

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Tallian, A., D.W. Smith, D.R. Stahler, M.C. Metz, R.L. Wallen, C. Geremia, J. Ruprecht, C.T. Wyman, & D.R. MacNulty. 2017. Predator foraging response to a resurgent dangerous prey. *Functional Ecology* doi: 10.1111/1365-2435.12866.

Uboni, A., D.W. Smith, D.R. Stahler, & J.A.Vucetich. 2017. Selecting habitat to what purpose? The advantage of exploring the habitat–fitness relationship. *Ecosphere* 8: e01705.

Wolf Project Volunteers, 2017.

Name	Hours
Erika Anderson	288
Bethany Barratt	296
Richard Brown	288
Adam Fahnestock	584
Lianna Ferguson	296
Maddie Flamm	128
Zachary Gregory	296
Sally Henkel	296
Jason Labrie	288
Elise Loggers	288
Kenneth Loonam	296
Collin Peterson	296
Jack Rabe	928
David Rolfes	296
Elisa Sandoval Seres	296
Andy Stratton	640
Nikki Tatton	288
TOTAL	**6088**

Becca Thomas Kuzilik overcomes the smell and works her way through a wolf-killed bison for samples. Photo ©J. Hanson

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

Mollie's pack wolves attempt to sneak up on a resting bull bison. NPS Photo - K. Cassidy

Suggested citation: Smith, D., D. Stahler, K. Cassidy, E. Stahler, M. Metz, B. Cassidy, L. Koitzsch, Q. Harrison, R. Thomas-Kuzilik, R. McIntyre, E. Cato. 2018. Yellowstone National Park Wolf Project Annual Report 2017. National Park Service, Yellowstone Center for Resources, Yellowstone National Park, WY, USA, YCR-2018-03.