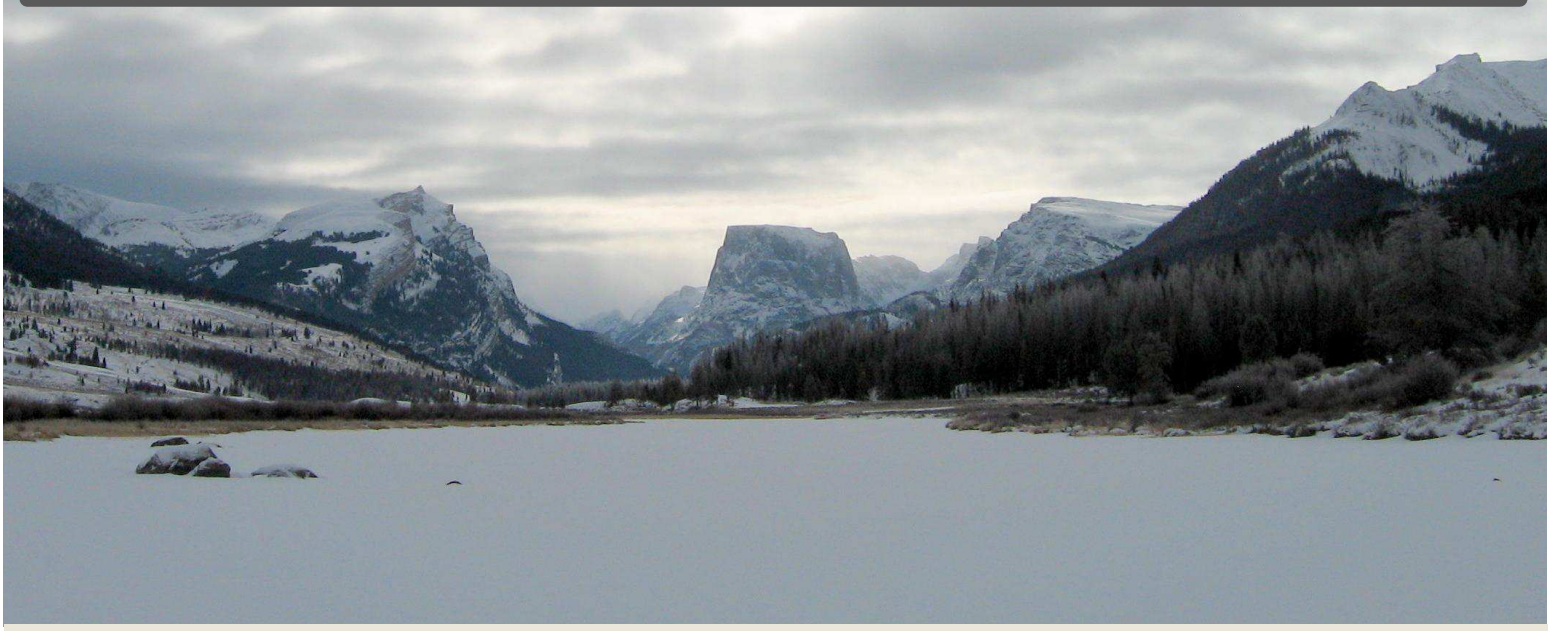
# WYOMING GRAY WOLF MONITORING AND MANAGEMENT

## 2017 ANNUAL REPORT



***Prepared by the Wyoming Game and Fish Department in cooperation with the National Park Service, U.S. Fish and Wildlife Service, USDA-APHIS-Wildlife Services, and Eastern Shoshone and Northern Arapahoe Tribal Fish and Game Department to fulfill the U.S. Fish and Wildlife Service requirement to report the status, distribution and management of the gray wolf population in Wyoming from January 1, 2017 through December 31, 2017.***

## EXECUTIVE SUMMARY

At the end of 2017, the gray wolf population in Wyoming remained above minimum delisting criteria; making 2017 the 16th consecutive year Wyoming has exceeded the numerical, distributional, and temporal delisting criteria established by U.S. Fish and Wildlife Service. At least 347 wolves in ≥53 packs (including ≥23 breeding pairs) inhabited Wyoming on December 31, 2017. Of the total, there were ≥97 wolves and ≥11 packs (including ≥3 breeding pairs) in Yellowstone National Park, ≥12 wolves and ≥2 packs (≥1 breeding pair) in the Wind River Reservation, and ≥238 wolves and ≥40 packs (including ≥19 breeding pairs) in Wyoming outside Yellowstone National Park and the Wind River Reservation.

A total of 168 wolf mortalities were documented statewide in Wyoming in 2017: 162 in Wyoming outside Yellowstone National Park and the Wind River Reservation; 5 in Yellowstone National Park; and 1 in the Wind River Reservation. Causes of mortality included: human-caused = 150 (89% of mortalities); natural = 12 (7%); and unknown = 6 (4%). Seventy-two wolves were captured and radio-collared for monitoring purposes in 2017. Eighty-three radio-collared wolves in 33 packs were being monitored at the end of 2017 in Wyoming (24% of the year-end population). A total of $677,114 was spent to monitor and manage wolves in Wyoming by all jurisdictions combined, not including livestock depredation compensation.

In 2017, the Wyoming Game and Fish Department instituted a wolf hunting season with the biological objective to reduce the wolf population by approximately 24% in the Wolf Trophy Game Management Area. A mortality quota of 44 wolves was divided between 12 hunt areas in Wyoming. Wolf hunting seasons were open from October 1, 2017 through December 31, 2017 with the exception of hunt area 12, which opened on October 15, 2017. Individual hunt areas closed if the mortality quota for that hunt area was reached prior to the December 31, 2017 closing date. A total of 43 wolves were legally harvested and 1 wolf was illegally killed during the hunting season. Wolves could also be taken in any legal manner in Wyoming where they are designated as predatory animals. Thirty-three wolves were taken under predatory animal status in 2017.

Wolves were confirmed to have killed 194 head of livestock (113 cattle and 81 sheep) and 1 dog statewide in Wyoming in 2017. An additional 5 cattle were injured by wolves but survived. Of the 29 packs involved in ≥1 depredation statewide, 21 packs were involved in ≥2 depredations and 19 packs were involved in ≥3 depredations. Control efforts lethally removed 62 depredating wolves statewide in an effort to reduce livestock losses due to wolves. A combined minimum of $528,328 was spent on wolf damage management in Wyoming by Wildlife Services ($216,714) and livestock depredation compensation by the State of Wyoming ($311,614) in 2017.

***Suggested Citation:*** Wyoming Game and Fish Department, U.S. Fish and Wildlife Service, National Park Service, USDA-APHIS-Wildlife Services, and Eastern Shoshone and Northern Arapahoe Tribal Fish and Game Department. 2018. Wyoming Gray Wolf Monitoring and Management 2017 Annual Report. K.J. Mills and Z. Gregory, eds. Wyoming Game and Fish Department, 5400 Bishop Blvd. Cheyenne, WY 82006.

Available for download at:
**https://wgfd.wyo.gov/WGFD/media/content/PDF/Wildlife/Large%20Carnivore/WYWOLF_ANNUALREPORT_2017.pdf**

# TABLE OF CONTENTS

# LIST OF FIGURES



# LIST OF TABLES

## BACKGROUND

Beginning in 1995, the U.S. Fish and Wildlife Service reintroduced 41 gray wolves (wolves) into Yellowstone National Park, Wyoming as a nonessential experimental population under the Endangered Species Act with the goal of reestablishing a sustainable gray wolf population in the northern Rocky Mountains. The U.S. Fish and Wildlife Service was the federal agency charged with administering, monitoring, and managing the wolf population following reintroduction until wolves reached recovery levels and Endangered Species Act protections could be removed ("delisting"). The wolf population expanded quickly in number and distribution throughout northwest Wyoming. The population reached the required delisting criteria by late 2002 and has exceeded the recovery criteria every year since. More information on wolves and the history of the wolf reintroduction program can be found on the U.S. Fish and Wildlife Service website and the Wyoming Game and Fish Department website at the following links:

https://www.fws.gov/mountain-prairie/es/grayWolf.php
https://wgfd.wyo.gov/Wildlife-in-Wyoming/Large-Carnivore/Wolves-in-Wyoming

Wolves were delisted in Wyoming in September 2012 following the approval of the Wyoming Gray Wolf Management Plan, Wyoming Game and Fish Commission regulations, and Wyoming Statutes by the U.S. Fish and Wildlife Service (U.S. Fish and Wildlife Service 2012). This delisting decision was challenged in U.S. District Court in Washington, D.C., which overturned the delisting and relinquished management authority for wolves in Wyoming to the U.S. Fish and Wildlife Service. The District Court decision was subsequently appealed by the U.S. Fish and Wildlife Service and State of Wyoming in the U.S. Court of Appeals in Washington. D.C., which ruled in favor of the U.S. Fish and Wildlife Service and State and returned management of wolves to the State of Wyoming on April 25, 2017. Wolf monitoring and management outside national parks and the Wind River Reservation were conducted by the U.S. Fish and Wildlife Service before delisting on April 25, 2017. The Wyoming Game and Fish Department monitored and managed wolves in Wyoming following delisting on April 25, 2017 outside national parks, the Wind River Reservation, and the National Elk Refuge. In 2017, wolves were monitored and managed by the National Park Service in Yellowstone National Park and Grand Teton National Park, the Eastern Shoshone and Northern Arapaho Tribal Fish and Game Department in cooperation with the U.S. Fish and Wildlife Service Lander Fish and Wildlife Conservation Office on tribal lands in the Wind River Reservation, and the U.S. Fish and Wildlife Service on the National Elk Refuge.

As mentioned above, once wolves were delisted, wolf management responsibility was transferred to multiple jurisdictions in Wyoming. Each management agency has different laws, regulations, and/or management plans governing wolf management and, accordingly, each jurisdiction has varying wolf management objectives and philosophies. The following is a summary of the management direction by agency.

### National Park Service

The National Park Service is responsible for monitoring and managing wolves in national parks in Wyoming. The National Park Service's primary wolf management approach is to allow

natural processes to occur within the boundaries of national parks with minimal human intervention. More information on National Park Service wolf programs in Wyoming can be found at the following links:
https://www.nps.gov/yell/learn/nature/wolfmgnt.htm
https://www.nps.gov/grte/index.htm

**Eastern Shoshone and Northern Arapaho Tribal Fish and Game Department**

The Eastern Shoshone and Northern Arapaho Tribal Fish and Game Department, in cooperation with the U.S. Fish and Wildlife Service Lander Fish and Wildlife Conservation Office, is responsible for monitoring and management of wolves on tribal lands within the boundaries of the Wind River Reservation. The Wind River Reservation Wolf Management Plan designates wolves as a trophy game animal, but there were no open hunting seasons in 2017 and wolves could only be legally killed to defend life or property. For more information, see the Wind River Reservation Wolf Management Plan at:
https://www.fws.gov/mountain-prairie/es/species/mammals/wolf/Wind_River_Res_Wolf_Plan_20070413.pdf

**National Elk Refuge**

The National Elk Refuge, managed by the U.S. Fish and Wildlife Service, was established to provide winter habitat and supplemental winter feeding for the Jackson Elk Herd. The U.S. Fish and Wildlife Service is responsible for the management of all wildlife species, including wolves, within National Elk Refuge boundaries. More information on the National Elk Refuge can be obtained at:
https://www.fws.gov/refuge/national_elk_refuge/

**Wyoming Game and Fish Department**

Wolves in Wyoming outside Yellowstone National Park and the Wind River Reservation (WYO) are monitored and managed by the Wyoming Game and Fish Department. The Wyoming Game and Fish Department wolf management approach is to maintain a recovered wolf population in Wyoming while balancing the need to minimize wolf conflicts with livestock and wild ungulate herds. Wyoming's Gray Wolf Management Plan also seeks to incorporate public hunting opportunity into its wolf population management strategy. Wyoming's wolf management framework is more complex than the National Park Service's and the Wind River Reservation's and warrants more detailed explanation. As required by state law, wolves in WYO are managed under the dual classifications of trophy game animal and predatory animal as outlined in the Wyoming Gray Wolf Management Plan and approved by the U.S. Fish and Wildlife Service. There are 3 wolf management "zones" in WYO, as follows:

1. *Wolf Trophy Game Management Area (WTGMA):* Wolves are designated as trophy game animals year-round within the WTGMA. Wolves in the WTGMA are managed similar to other trophy game species (e.g., black bears and mountain lions) and may only be taken by the public when in the act of doing damage to private property, under the authority of a lethal take permit, or by licensed hunters during an open wolf hunting

season. Livestock owners who have confirmed wolf depredations on livestock in the WTGMA may qualify for compensation from the Wyoming Game and Fish Department.

2. *Seasonal WTGMA:* Wolves are designated as trophy game animals in the Seasonal WTGMA from October 15 through the last day of February of the subsequent year and as predatory animals from March 1 to October 14 each year. Wolves may be taken by the public similar to wolves in the WTGMA while they are designated as trophy game animals, or may be taken as predatory animals for the remainder of the year (see below). Livestock owners who have confirmed wolf depredation on livestock in the Seasonal WTGMA may qualify for compensation from the Wyoming Game and Fish Department on a year-round basis regardless of the date damage occurred.

3. *Areas when and where wolves are designated as predatory animals:* Wolves are designated year-round as predatory animals in areas outside of the WTGMA and also within the Seasonal WTGMA from March 1 to October 14 (see above). Predatory animals may be taken anytime in any legal manner. Livestock owners who have confirmed wolf depredation on livestock outside the WTGMA/Seasonal WTGMA do not qualify for compensation from the Wyoming Game and Fish Department unless their private land is bisected by the WTMGA or Seasonal WTGMA boundary.

For more information on the wolf management framework in WYO, including the Wyoming Gray Wolf Management Plan and wolf management and hunting regulations, please visit the following link:
https://wgfd.wyo.gov/Wildlife-in-Wyoming/Large-Carnivore/Wolves-in-Wyoming

**Wolf Population Delisting Criteria and Post-Delisting Monitoring**

The U.S. Fish and Wildlife Service set specific recovery goals for wolves in the northern Rocky Mountains that were required to be met prior to delisting. The wolf population in the northern Rocky Mountains must also continue to meet or exceed the U.S. Fish and Wildlife Service's delisting criteria post-delisting to ensure the population remains recovered. The U.S. Fish and Wildlife Service developed minimum delisting criteria of ≥300 wolves and ≥30 breeding pairs (a pack with at least 1 adult male and 1 adult female wolf that successfully raise at least 2 pups of the year until December 31) in the northern Rocky Mountains for 3 consecutive years. These criteria were developed using input from many wolf experts from around the world.

Additionally, the U.S. Fish and Wildlife Service developed delisting criteria that required the states to maintain a 50% buffer above minimum delisting criteria (i.e., ≥450 wolves and ≥45 breeding pairs in the northern Rocky Mountains) to ensure the population never fell below minimum delisting goals. The delisting criteria were then subdivided equally among the states of Montana, Idaho, and Wyoming, resulting in a minimum population requirement of ≥150 wolves and ≥15 breeding pairs in Wyoming at the end of the calendar year. Under the terms of the delisting agreement between Wyoming and the U.S. Fish and Wildlife Service, the state of Wyoming is required to maintain wolves at or above the minimum delisting criteria of ≥100 wolves and ≥10 breeding pairs in WYO, with Yellowstone National Park and the Wind River Reservation providing the additional buffer of ≥50 wolves and ≥5 breeding pairs necessary to

meet the ≥150 wolf and ≥15 breeding pair requirement for the state (U.S. Fish and Wildlife Service 2012).

Under the Endangered Species Act, states are required to manage delisted species in a sustainable manner to ensure the population will remain above the minimum delisting criteria into the foreseeable future. Once delisting occurs, the U.S. Fish and Wildlife Service is required, in cooperation with the states, to monitor the status of delisted species. The primary goal of post-delisting monitoring is to provide the U.S. Fish and Wildlife Service with a mechanism for evaluating the status of the population and ensure states are managing the delisted population at or above minimum delisting criteria. This annual report is a product of cooperation between all agencies in Wyoming with wolf monitoring and management responsibility and provides the U.S. Fish and Wildlife Service with the required information for their post-delisting monitoring evaluation for the 2017 calendar year.

**Reporting Wolf Population Data by Jurisdiction**

Generally, states are solely responsible for monitoring and managing delisted species. In Wyoming, however, multiple large jurisdictions where the state does not have management authority, primarily Yellowstone National Park and the Wind River Reservation, contain significant portions of the wolf population and/or suitable wolf habitat. This sharing of large portions of the wolf population complicated management in Wyoming and made it difficult to determine which jurisdiction was responsible for what proportion of minimum delisting criteria. Therefore, it was necessary to clarify how many wolves and breeding pairs each jurisdiction would contribute toward minimum delisting criteria (i.e., ≥150 wolves and ≥15 breeding pairs in Wyoming at the end of the calendar year). The U.S. Fish and Wildlife Service and state of Wyoming agreed on a framework that would assign proportions of the minimum delisting criteria to the 3 major jurisdictions as follows:

1. The state of Wyoming is responsible for maintaining ≥100 wolves and ≥10 breeding pairs in WYO. While the state does not have management authority over wolves in all areas in WYO such as Grand Teton National Park and the National Elk Refuge, these areas are small and the wolf packs using these areas are not solely contained within their boundaries. Therefore, wolves in Grand Teton National Park and the National Elk Refuge are assigned to WYO.

2. Yellowstone National Park, in combination with the Wind River Reservation, is expected to contribute the remaining buffer of ≥50 wolves and ≥5 breeding pairs necessary to meet the ≥150 wolf and ≥15 breeding pair requirement. Data for these jurisdictions are reported independently in the body of this report.

For purposes of this report, data are presented on the wolf population as a whole in Wyoming and are further summarized by the three major jurisdictions (i.e., WYO, Yellowstone National Park, and the Wind River Reservation) to allow for proper evaluation of the wolf population both statewide and by major jurisdiction.

# WYOMING GRAY WOLF MONITORING AND MANAGEMENT 2017 ANNUAL REPORT

# WOLF POPULATION MONITORING

## SUMMARY OF WOLF POPULATION MONITORING STATEWIDE

At the end of 2017, the wolf population in Wyoming remained above minimum delisting criteria; making 2017 the 16th consecutive year Wyoming has exceeded the numerical, distributional, and temporal delisting criteria established by U.S. Fish and Wildlife Service. At least 347 wolves in ≥53 packs (including ≥23 breeding pairs) inhabited Wyoming on December 31, 2017. Of the total, there were ≥97 wolves and ≥11 packs (including ≥3 breeding pairs) in Yellowstone National Park, ≥12 wolves and ≥2 packs (≥1 breeding pair) in the Wind River Reservation, and ≥238 wolves and ≥40 packs (including ≥19 breeding pairs) in Wyoming outside Yellowstone National Park and the Wind River Reservation (WYO). A total of 168 wolf mortalities were documented statewide in Wyoming in 2017 (162 in WYO, 5 in Yellowstone National Park, and 1 in the Wind River Reservation). Causes of mortality included: human-caused = 150 (89%); natural = 12 (7%); and unknown = 6 (4%). Seventy-two wolves were captured and radio-collared for monitoring purposes in 2017. Eighty-three radio-collared wolves in 33 packs were being monitored at the end of 2017 in Wyoming (24% of the year-end population). A total of $677,114 was spent to monitor and manage wolves in Wyoming by all jurisdictions combined, not including livestock depredation compensation.

### Wolf Population Monitoring in WYO

#### *Capture and Radio-collaring*

Radio-collars are the primary tool used for monitoring wolf populations in Wyoming. Wolves were captured using ground or aerial capture techniques. Radio-collars were affixed to captured wolves and personnel collected morphological information, genetic samples, and blood for disease testing. Radio-collared wolves were released on site and monitored to document territories, movements (including dispersal), pack numbers, pack composition, breeding status and success, to mitigate livestock conflicts, and to aid in law enforcement investigations.

Forty-five wolves from 24 packs were radio-collared in 2017 in WYO (aerial = 36; ground = 9), including 2 recaptures. At the end of 2017, there were 44 wolves in 21 packs and 3 collared single wolves that had dispersed from their packs that were radio-collared (47 total; 20% of the year-end population in WYO). Winter capture efforts continued through the end of March 2018 in conjunction with 2017 year-end population surveys, at which point a total of 65 wolves in 28 packs and 3 single wolves were being monitored via radio-collars (68 total; 29% of the population in WYO at the end of March 2018). The proportion of radio-collared individuals is generally highest at the end of winter following aerial capture efforts and decreases throughout the remainder of the year as pups are born in April and radio-collared wolves die, disperse, or go missing when collars fail or batteries expire. VHF radio-collars were used for general monitoring purposes and various types of global positioning system (GPS) collars for specific monitoring or research projects.

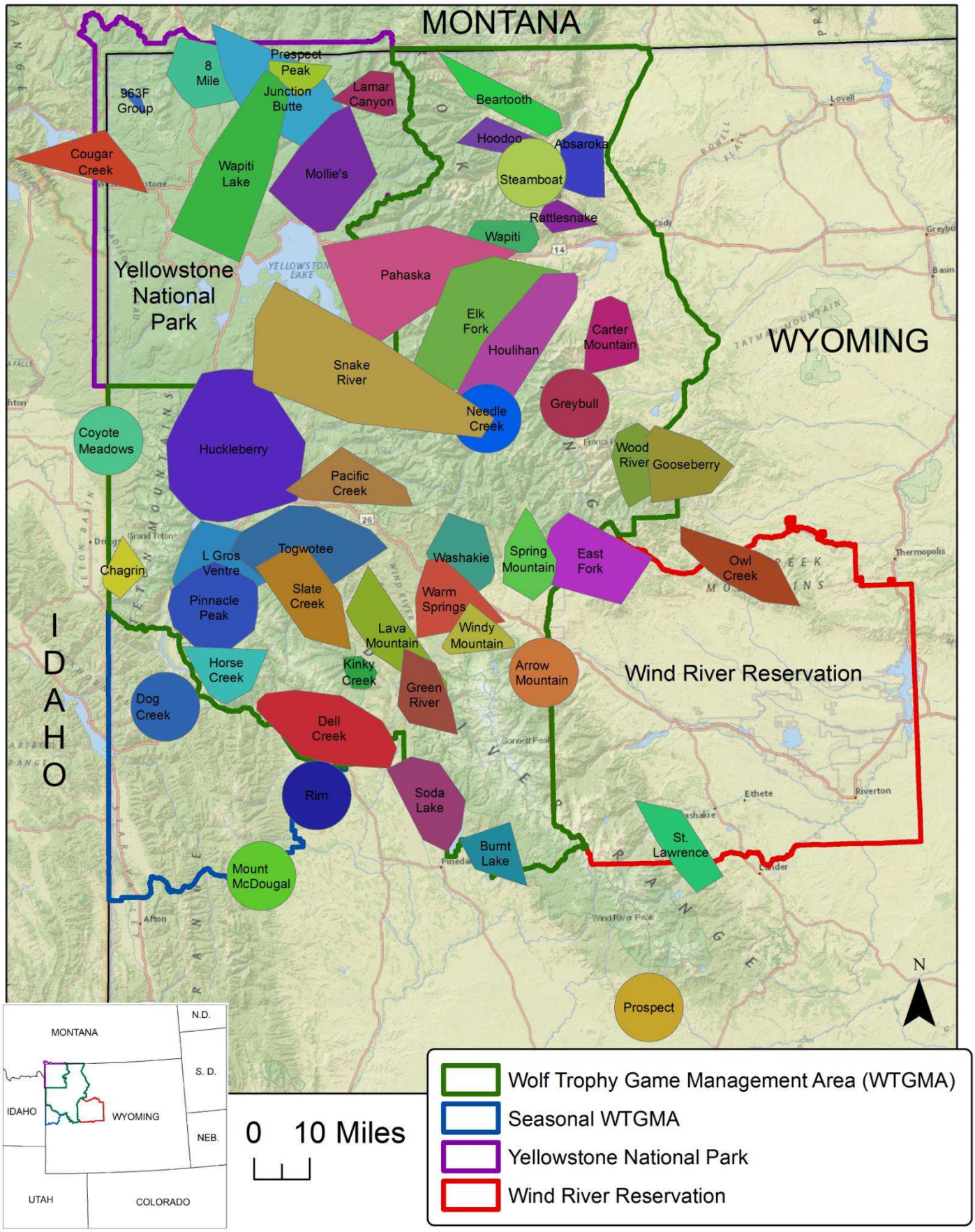



**Figure 1**. Home ranges of confirmed wolf packs in Wyoming in 2017.

**Table 1.** Wolf packs, wolf mortality, and livestock depredation in Wyoming outside Yellowstone National Park and the Wind River Reservation (WYO), Yellowstone National Park, the Wind River Reservation, and statewide in 2017.

| WOLF PACK[1,2] | MINIMUM PACK SIZE | DOCUMENTED MORTALITIES | | | | | | KNOWN DISPERSED | MISSING[8] | CONFIRMED LOSSES[9] | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | NATURAL | HUMAN[3] | UNKN[4] | HUNTING[5] | PRED. ANIMAL[6] | CONTROL[7] | | | CATTLE | SHEEP | DOGS | OTHER |
| **Wyoming Outside Yellowstone National Park and the Wind River Reservation (WYO)** | | | | | | | | | | | | | |
| Absaroka | 9 | | | | 2 | | 2 | | | 2 | | | |
| Arrow Mountain | 7 | | | | 2 | | | | | | | | |
| Beartooth | 8 | | | | | | | | 2 | 3 | | | |
| Burnt Lake | 7 | | | | | | | | 1 | | | | |
| Carter Mountain | 6 | | | | 4 | | | | | 3 | | | |
| Chagrin^ | 7 | | | | | | | 1 | 1 | | | | |
| Coyote Meadows^ | 4 | | | | | | 2 | | | 2 | | | |
| Dell Creek | 9 | 1 | 1 | | 1 | 2 | 1 | 1 | | 2 | | | |
| Dog Creek | 3 | | | | | | | | | | | 1 | |
| East Fork^ | 2 | | | 1 | 1 | 3 | 5 | | | 5 | | | |
| Elk Fork Creek | 6 | | | | 3 | | | | | | | | |
| Ferris Mountain | 2 | | | | | 6 | | | | 16 | | | |
| Gooseberry | 4 | | 1 | | | 2 | | | | | | | |
| Green River | 4 | 2 | | | 2 | | 3 | 1 | | 6 | | | |
| Greybull River | 2 | | | | | | | | | | | | |
| Hoodoo | 9 | | | | 4 | | 2 | | | 1 | | | |
| Horse Creek | 6 | | | | 2 | | | 3 | | | | | |
| Houlihan | 3 | | 1 | | | | 5 | 1 | | 12 | | | |
| Huckleberry^ | 7 | | | | | | | 1 | | | | | |
| Kinky Creek | 2 | | | | | | | | | 1 | | | |
| ~~Lander~~ | | 1 | | 1 | | 8 | 2 | | | 2 | | | |
| Lava Mountain | 11 | 1 | | | | | 3 | | | 4 | | | |
| ~~Little Greys River~~ | | | | | | 1 | 1 | | | | 36 | | |
| Lower Gros Ventre | 5 | | 1 | | | | | | | | | | |
| Mount McDougal | 8 | | | | | 1 | | | | 1 | | | |
| Needle Creek | 2 | | | | | | | | | | | | |
| ~~North Fork~~ | | | | 1 | 2 | | | | | | | | |
| Pacific Creek | 8 | | | | 2 | | 1 | | | | | | |
| Pahaska^ | 13 | 1 | 1 | | | | | | | | | | |
| ~~Phantom Springs~~ | | | 1 | | 1 | | | 1 | | 1 | | | |
| Pinnacle Peak | 11 | 1 | | | | | 3 | | | 11 | | | |
| Prospect | 2 | | | | | 1 | 1 | | | | 13 | | |
| Rattlesnake | 6 | | | | 1 | | 1 | | | 3 | | | |
| Rim | 4 | | | | | 3 | | | | 1 | | | |
| Slate Creek | 12 | | 2 | | 5 | | | 1 | | 3 | | | |
| Soda Lake | 6 | | 1 | | 2 | 3 | | | | 1 | | | |
| ~~South Fork~~ | | | | | 1 | | 12 | 1 | | 7 | | | |
| ~~South Pass~~ | | | | | | | 7 | | | 3 | | | |
| ~~Sunshine~~ | | | | | | | | | | | | | |
| Spring Mountain | 3 | | | | 2 | | | | 2 | 1 | | | |
| Steamboat | 3 | | | | | | | | | | | | |
| Togwotee | 6 | | | | 3 | | | | | | | | |
| Wapiti | 3 | | 1 | 2 | | | 1 | 1 | 1 | | | | |
| Warm Springs | 3 | | | | | | 2 | 1 | | 5 | | | |
| Washakie | 2 | 1 | | 1 | 1 | | 3 | 1 | | 7 | | | |
| Windy Mountain | 6 | | | | | | | | | | | | |
| Wood River | 3 | | | | | | | | | | | | |
| Misc wolves | 14 | | 1 | | 2 | 3 | 4 | | | 7 | 32 | | |
| **WYO Total** | **238** | **8** | **11** | **6** | **43** | **33** | **61** | **14** | **7** | **110** | **81** | **1** | **0** |
| **Yellowstone N.P. Total** | 97 | 4 | 1 | 0 | 0 | 0 | 0 | 6 | 4 | 0 | 0 | 0 | 0 |
| **Wind River Res. Total** | 12 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 3 | 0 | 0 | 0 |
| **WYOMING TOTAL** | **347** | **12** | **12** | **6** | **43** | **33** | **62** | **20** | **11** | **113** | **81** | **1** | **0** |

1 Underlined packs are counted as breeding pairs toward recovery goals.
2 Strikethough packs were not documented during 2017 and/or did not exist on Dec. 31, 2017 and are not displayed in Figure 1.
3 Excludes wolves killed in control actions and legal harvest.
4 Number of wolves that died of unknown causes.
5 Number of wolves legally taken in trophy game hunts in 2017. Includes 1 wolf from the Snake River pack assigned to Yellowstone National Park.
6 Number of wolves legally taken by the public as predatory animals in 2017. Includes 1 wolf from the Owl Creek pack assigned to the Wind River Reservation.
7 Number of wolves killed in control by agencies and private citizens in WY in 2017. Includes 4 wolves from the Owl Creek pack assigned to the Wind River Reservation.
8 Collared wolves that became missing in 2017.
9 Number of domestic animals confirmed killed by wolves. Includes animals killed in WYO by packs assigned to the Wind River Reservation.
^ Border pack shared with Idaho, Yellowstone National Park or the Wind River Reservation; assigned to WYO.

***Population and Breeding Pair Status***

The minimum population for wolves in Wyoming on December 31, 2017 was determined using standard wolf monitoring methods that have been used since their reintroduction. The number of wolves in individual packs was estimated at the end of the year by counting wolves from the air during aerial telemetry flights and capture operations, observations confirmed by qualified agency personnel, or pictures of known packs taken with remote cameras. Only pack observations obtained from December 2017 through March 2018 were included to ensure they were reflective of the minimum number of wolves present on December 31, 2017. Miscellaneous, mostly solitary, wolves were included in the estimate only if the observations were confirmed by qualified agency personnel and the animal was not a member of a known pack. In WYO, wolf monitoring is most intensive in the Wolf Trophy Game Management Area (WTGMA) with less intensive monitoring in the Seasonal WTGMA and predatory animal areas (Figure 1). Packs with territories overlapping jurisdictional boundaries (e.g., state, national park, tribal boundaries, etc.) were assigned to the jurisdiction which held the majority of their documented locations during 2017. The final minimum population count was the sum of all pack counts and miscellaneous wolves known to be present on December 31, 2017.

Breeding pair status was also determined using methods utilized since wolves were reintroduced to the northern Rocky Mountains. Denning behavior was confirmed for individual packs using aerial and ground telemetry and ground investigations during spring. The presence of pups with packs was confirmed using observations made during aerial and ground monitoring efforts, investigations of potential den and rendezvous sites, howling surveys, reports confirmed by qualified agency personnel, pictures taken with remote cameras, evaluations of changes in pack size, or a combination of methods. If 1 adult male and 1 adult female and ≥2 pups were adequately documented at the end of the calendar year, they were counted as a known breeding pair. Breeding pairs will continue to be documented using this method for at least the post-delisting monitoring period, but the Wyoming Game and Fish Department is also investigating the use of more efficient methods to determine breeding pair status over the long term. The model reported in Mitchell et al. (2007) for Wyoming is an efficient method for estimating breeding pairs based on pack size. This method uses annual pack count data to estimate the probability that a pack with ≥4 wolves is a breeding pair. The probability that each pack is a breeding pair can then be summed to produce an estimate of the number of breeding pairs in the population. Mitchell et al.'s model will be applied to packs with ≥4 members with unknown breeding pair status to determine how many of these packs were likely to have been breeding pairs at the end of 2017. The results of this model will only be considered as informative and will be reported as an estimated number of breeding pairs in addition to the confirmed number of breeding pairs in this report. The Wind River Reservation and Yellowstone National Park's minimum wolf populations and breeding pairs were counted using analogous methods.

As of December 31, 2017, ≥238 wolves in ≥40 packs, including ≥19 breeding pairs were documented in WYO; ≥198 wolves in ≥34 packs resided primarily in the WTGMA and ≥40 wolves in ≥6 packs resided in areas where wolves are designated primarily as predatory animals (Figure 1, Table 1). Pack size ranged from 2-13 and averaged 5.6 wolves per pack. Nineteen packs qualified as breeding pairs on December 31, 2017; 18 were located in the WTMGA and one was located in the Seasonal WTGMA (Figure 1, Table 1). Breeding pair status could not be

determined for 7 packs with ≥4 members at the end of the calendar year. Using the model reported in Mitchell et al. (2007), ≥4 of these packs would likely have qualified as breeding pairs in addition to the 18 breeding pairs confirmed by field data, which would yield an estimate of ≥22 breeding pairs in WYO on December 31, 2017. A total of $422,732 was spent to monitor and manage wolves in WYO in 2017; $278,732 by the Wyoming Game and Fish Department and $144,000 by Grand Teton National Park, not including $311,614 paid in compensation for verified livestock depredation in the WTGMA and Seasonal WTGMA.

***Population Trend***

During the course of 2017, Wyoming Game and Fish Department personnel documented an additional 6 wolf packs comprising about 25 wolves that existed in WYO (19 in the WTMGA and 6 in the predatory animal areas) on December 31, 2016 that were not included in the 2016 annual wolf population count. These wolves were retroactively added to the end of 2016 population estimate to provide more accurate assessment of wolf population trend in 2017. The WYO end of year wolf population decreased 16% from 2016 to 2017 (≥285 wolves at the end of 2016 compared to ≥238 wolves at the end of 2017) and remained above the minimum delisting criterion of at least 100 wolves (Figure 2). Breeding pairs increased 6% from ≥18 in 2016 to ≥19 in 2017 and remained above the minimum delisting criterion of at least 10 breeding pairs. The population was primarily reduced through human-caused mortality (Table 1). Public take of wolves designated as predatory animals reduced the number of wolves present in areas exemplified by low habitat suitability, low re-colonization potential and historically high wolf-livestock conflicts (-29%; 56 wolves at the end of 2016 vs. 40 wolves at the end of 2017).

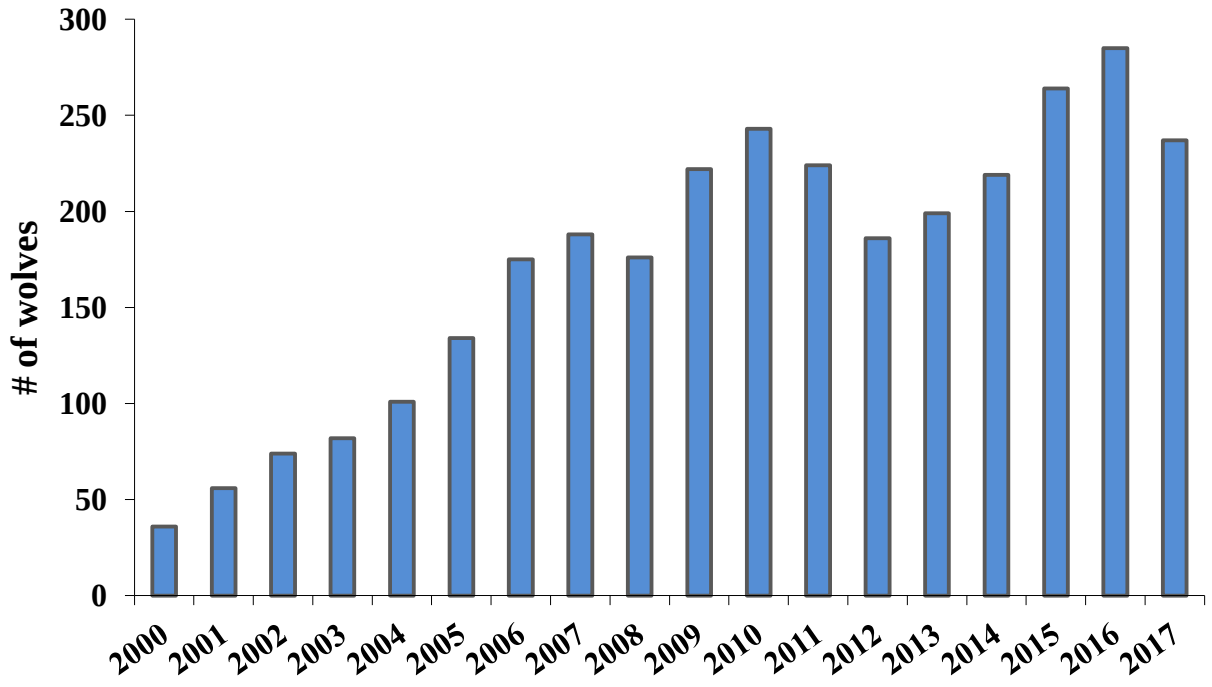



**Figure 2.** Minimum number of wolves in Wyoming outside Yellowstone National Park and the Wind River Reservation (WYO) from 2000-2017.

The number of wolf packs in WYO was slightly reduced from ≥44 packs at the end of 2016 to ≥40 packs at the end of 2017 (Figure 3). Six packs were documented in 2017 in WYO that existed at the end of 2016 but were not included in the 2016 estimate based on the multi-generational nature of the pack (Arrow Mountain, Coyote Meadows, Ferris Mountain, Mount McDougal, Rattlesnake, and Windy Mountain) and 3 new packs established in 2017 (Burnt Lake, Kinky Creek, and Steamboat; Table 1). Seven packs documented in 2017 did not exist on December 31, 2017, primarily as a result of human-caused mortality (Table 1).

There was little evidence suggesting the presence of wolf packs in the WTGMA that were not adequately documented in the minimum end of 2017 wolf population estimate. The vast majority of wolf observations recorded in WYO could be attributed to documented packs included in this report.

The number of known breeding pairs increased from ≥18 at the end of 2016 to ≥19 at the end of 2017 (Figure 3). Nine packs identified as breeding pairs in 2016 also qualified as breeding pairs at the end of 2017 (Beartooth, Dell Creek, Elk Fork Creek, Lava Mountain, Pacific Creek, Pahaska, Pinnacle Peak, Slate Creek, and Togwotee; Table 1). Ten packs that were not identified as breeding pairs in 2016 qualified as breeding pairs in 2017 (Absaroka, Arrow Mountain, Burnt Lake, Carter Mountain, Chagrin, Coyote Meadows, Hoodoo, Horse Creek, Mount McDougal, Rattlesnake; Table 1).

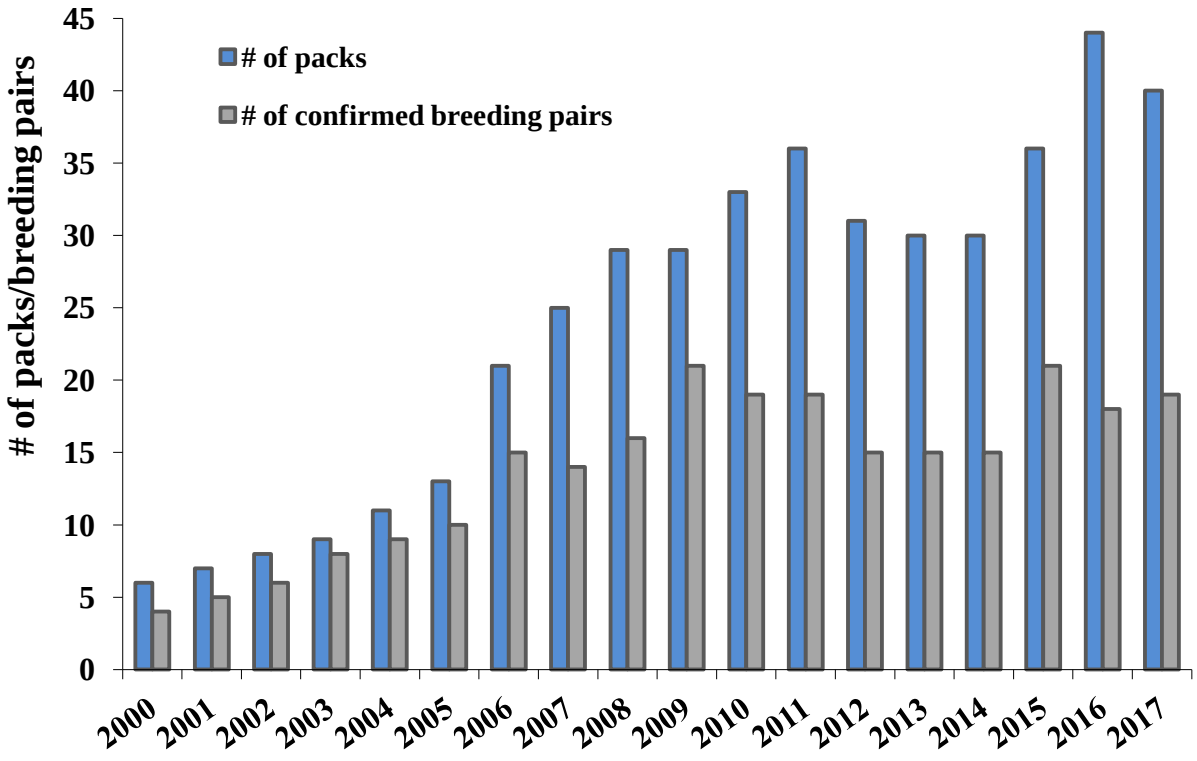



**Figure 3.** Minimum number of wolf packs and confirmed breeding pairs in Wyoming outside Yellowstone National Park and the Wind River Reservation (WYO) from 2000-2017.

***Mortality***

Wolf mortality was monitored in WYO using multiple methods. The primary method used for determining wolf mortalities occurring from non-hunting related causes was through the tracking of radio-collared wolves. Radio-collars were programmed to change pulse rate after the collar remained motionless for 5 hours, thereby allowing managers to monitor collared wolves for mortality status and visit the site to evaluate cause-specific mortality and collect carcasses for further evaluation through necropsy. Wolf hunting mortality in the WTMGA and predatory animal areas was monitored via reporting and registration by successful hunters as required in Wyoming Game and Fish Commission Chapter 47 Gray Wolf Hunting Season regulation (Chapter 47) and state statute. This requirement allowed Wyoming Game and Fish Department personnel to document mortality, collect information on harvested wolves, update mortality quotas in the WTGMA and Seasonal WTGMA, and close wolf hunting seasons quickly if the mortality quota was met. Cooperating agencies also provided information on wolf mortalities, including wolves killed in control actions by Wildlife Services. Wolf mortalities from all causes were documented and confirmed, including those found by the public, cooperating agencies, and Wyoming Game and Fish Department personnel.

In 2017, 162 wolves were known to have died in WYO; 110 in the WTGMA, 3 in the Seasonal WTGMA, and 49 in areas where wolves are designated as predatory animals year-round (Tables 1 and 2). Causes of mortality included: control = 61; trophy game hunting = 43; public take of predatory animals = 33, other human causes = 11; natural = 8; and unknown causes = 6 (Tables 1 and 2). The 11 wolf deaths from other human causes included 7 illegal kills, 2 vehicle collisions, 1 capture myopathy, and 1 wounding loss; all occurred in the WTGMA (One illegal kill was counted toward the mortality quota as this occurred during the open season for wolves in the WTGMA). The number of wolves that died in 2017 (162 wolves) was higher than in 2016 (128 wolves), and reduced the wolf population in WYO by 15% (Figure 2). Mortality from lethal control actions was 46% less than 2016 (61 in 2017 vs. 113 in 2016). Wolf hunting in the WTGMA, Seasonal WTGMA and predatory animal areas, which was not permitted in 2016 while wolves were protected under the Endangered Species Act, accounted for 76 wolf mortalities and was the primary cause for increased mortality between 2016 and 2017 (Table 2).

**Table 2.** Summary of wolf mortality in Wyoming outside Yellowstone National Park and the Wind River Reservation (WYO) in 2017 by cause of death and wolf management area. (# of wolves known to be alive in 2017 was calculated as 238 alive at end of year + 162 total mortalities in 2017 = 400 total wolves).

| | Total | % of mortality | % of wolves alive in 2017 | WTGMA | Seasonal WTGMA | PRED |
|---|---|---|---|---|---|---|
| Trophy Game Hunting | 43 | 26.5 | 10.8 | 43 | 0 | 0 |
| Predatory Animal Take | 33 | 20.4 | 8.3 | 0 | 2 | 31 |
| Control | 61 | 37.7 | 15.3 | 46 | 1 | 14 |
| Other human | 11 | 6.8 | 2.8 | 11 | 0 | 0 |
| Natural | 8 | 4.9 | 2.0 | 6 | 0 | 2 |
| Unknown | 6 | 3.7 | 1.5 | 4 | 0 | 2 |
| Total Mortality | 162 | 100.0 | 40.5 | 110 | 3 | 49 |

### *Disease Monitoring*

*Mange:* Sarcoptic mange is a highly contagious skin disease caused by mites (*Sarcoptes scabiei*) and is commonly found in wolf populations throughout the world. Mange was first detected in WYO in 2002. Mange continues to be an uncommon occurrence in WYO, with no cases observed in 2017. However, 2 wolves captured in February 2018 from 2 packs in the Jackson area showed signs of mange. The Wyoming Game and Fish Department continues to monitor for mange in wolves that die or are captured in WYO, but symptoms typical of mange are rarely documented.

*Canine Distemper Virus and Canine Parvovirus:* Canine distemper virus (distemper) and canine parvovirus (parvovirus) are highly contagious diseases that infect domestic dogs, coyotes, foxes, raccoons, skunks, and wolves. Based on other areas of the world that have experienced epizootic distemper and parvovirus infections, these diseases will occasionally cause mortality, particularly among pups. Outbreaks usually remain localized in specific areas/years and do not threaten regional wolf population viability. There was no documented mortality caused by distemper or parvovirus during 2017. Blood samples for 30 wolves captured in 2017 were tested for distemper; 6 of 30 (20%) tested positive for exposure to the virus. Parvovirus exposure has not been tested for these samples to date, but is expected to occur at a high rate among wolves in Wyoming (>80% of wolves exposed) based on historic prevalence rates. Monitoring for parvovirus and distemper will continue as more blood samples are collected during wolf capture operations and mortality causes are documented.

### *Genetic Monitoring*

The U.S. Fish and Wildlife Service determined that, in addition to minimum population criteria, genetic interchange must also occur between the 3 wolf recovery areas in the northern Rocky Mountains. To monitor whether this delisting criterion is met, the U.S. Fish and Wildlife Service requires that all states collect and analyze genetic samples from wolf populations in the northern Rocky Mountains. Analysis of genetic interchange will be conducted cooperatively between U.S. Fish and Wildlife Service and the states of Wyoming, Montana, and Idaho on a periodic basis (possibly every 12-20 years following 3-5 wolf generations). Genetic samples will continue to be collected from wolves in WYO to ensure enough genetic information is available to determine whether genetic interchange is occurring in the northern Rocky Mountains.

In 2017, genetic samples were collected from 133 wolves that will be used in analysis of genetic connectivity. Genetic samples were collected from 103 wolves that died and 30 wolves captured for monitoring purposes. As required by Chapter 47, 43 samples were submitted by wolf hunters who harvested wolves designated as trophy game animals and samples were voluntarily submitted by wolf hunters for 26 of 33 (79%) wolves taken as predatory animals.

## Wolf Population Monitoring on the Wind River Reservation

### *Capture and Radio-collaring*

One wolf was captured and radio-collared from the St. Lawrence pack for population monitoring purposes in 2017. At the end of 2017, 25% (3 wolves) of the known wolves in the Wind River Reservation were radio-collared, including 1 in the St. Lawrence pack and 2 in the Owl Creek pack.

### *Population and Breeding Pair Status*

Currently, wolves are classified as a trophy game animal on tribal lands in the Wind River Reservation, for which there is no open season and legal take can only occur to defend life or property. Wolves have been present in the Wind River Reservation for at least 15 years and are currently distributed across the Wind River and Owl Creek mountain ranges (Figures 1 and 4). The wolf subpopulation in the Wind River Reservation slowly increased through 2013 and has since fluctuated between 10 and 20 wolves (Figure 4). As of December 31, 2017, ≥12 wolves in ≥2 packs (St. Lawrence and Owl Creek) and ≥1 breeding pair were documented on the Wind River Reservation (Figures 1 and 4, Table 3). The East Fork pack and Arrow Mountain (Bob's Creek) pack also use portions of the Wind River Reservation, but are assigned to WYO because evidence for each pack was documented mostly outside the Wind River Reservation in 2017. A total of $16,400 was spent on wolf monitoring and management in the Wind River Reservation in 2013 ($10,900 by the U.S. Fish and Wildlife Service Lander Fish and Wildlife Conservation Office and $5,500 by the Eastern Shoshone and Northern Arapaho Tribal Fish and Game Department).

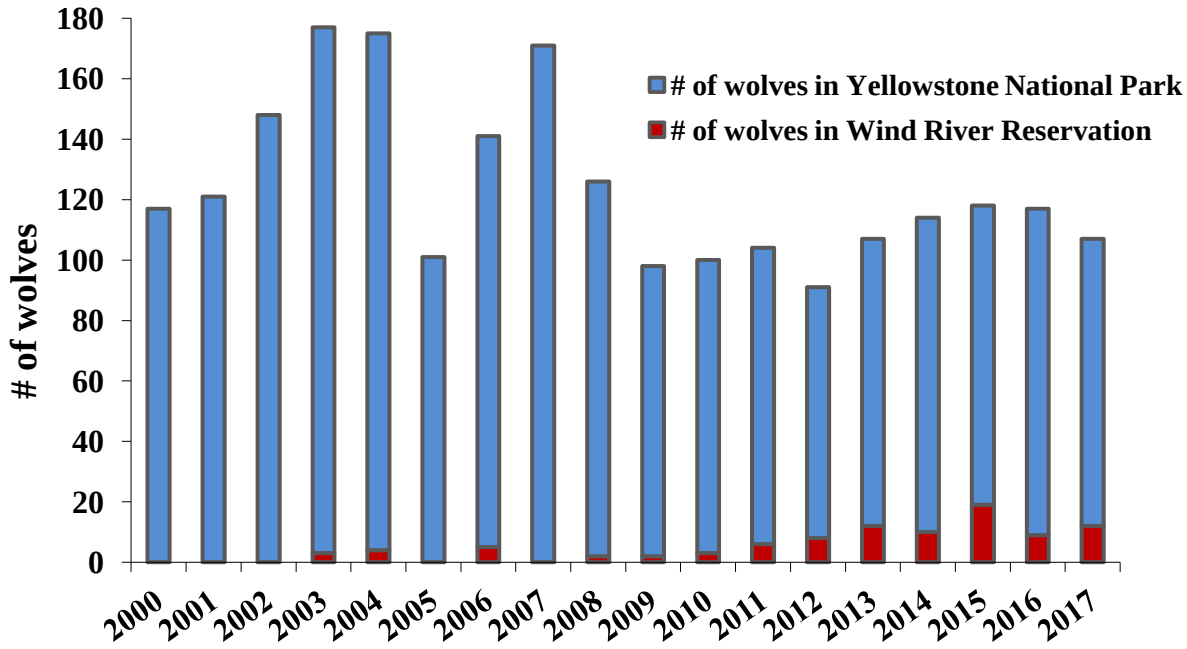



**Figure 4.** Minimum number of wolves in Yellowstone National Park and the Wind River Reservation from 2000-2017.

**Table 3.** Confirmed wolf packs, population data, and depredation information for packs present in Yellowstone National Park and the Wind River Reservation in 2017.

| WOLF PACK[1] | MINIMUM PACK SIZE | DOCUMENTED MORTALITIES | | | | | KNOWN DISPERSED | MISSING[6] | CONFIRMED LOSSES[7] | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | NATURAL | HUMAN[2] | UNKN[3] | HUNTING[4] | CONTROL[5] | | | CATTLE | SHEEP | DOGS | OTHER |
| **Yellowstone National Park Northern Range** | | | | | | | | | | | | |
| 8 Mile^ | 13 | 1 | | | | | 1 | 1 | | | | |
| Junction Butte | 8 | | | | | | 1 | | | | | |
| Lamar Canyon | 3 | 1 | | | | | | | | | | |
| 1108M Group | 5 | | | | | | | | | | | |
| Prospect Peak | 4 | 1 | | | | | 3 | | | | | |
| Misc wolves | 0 | | | | | | | | | | | |
| **Yellowstone National Park Non-Northern Range** | | | | | | | | | | | | |
| 963F Group^ | 2 | | | | | | | | | | | |
| Bechler % | 8 | | | | | | | | | | | |
| ~~Canyon~~ | 0 | | 1 | | | | | 1 | | | | |
| Cougar Creek | 7 | | | | | | | 2 | | | | |
| Mollie's | 14 | | | | | | | | | | | |
| Snake River# | 12 | 1 | | | | | 1 | | | | | |
| Wapiti Lake | 21 | | | | | | | | | | | |
| Misc wolves | 0 | | | | | | | | | | | |
| **Yellowstone National Park Total** | **97** | **4** | **1** | **0** | **0** | **0** | **6** | **4** | **0** | **0** | **0** | **0** |
| **Wind River Reservation** | | | | | | | | | | | | |
| Owl Creek* | 2 | | | | | | | | | | | |
| St. Lawrence | 10 | | | | | 1 | | | 3 | | | |
| Misc/Lone wolves | | | | | | | | | | | | |
| **Wind River Reservation Total** | **12** | **0** | **0** | **0** | **0** | **1** | **0** | **0** | **3** | **0** | **0** | **0** |
| **Total in Yellowstone N.P. and Wind River Res.** | **109** | **4** | **1** | **0** | **0** | **1** | **6** | **4** | **3** | **0** | **0** | **0** |

1 Underlined packs are counted as breeding pairs toward recovery goals.
2 Excludes wolves killed in control actions and lawful harvest.
3 Does not include pups that disappeared before winter.
4 Number legally harvested by humans outside Yellowstone National Park and the Wind River Reservation in WY in 2017. See narrative for details.
5 Includes lethal control by agencies and private citizens in WY outside Yellowstone National Park and the Wind River Reservation in 2017.
6 Collared wolves that became missing in 2017.
7 Includes only domestic animals confirmed killed by wolves.
% Border pack with ID, assigned to Yellowstone National Park.
^ Border pack with MT, assigned to Yellowstone National Park.
# Border pack with WY, assigned to Yellowstone National Park.
* Border pack with WYO, assigned to the Wind River Reservation.

### *Mortality*

One wolf from the St. Lawrence pack was killed in a lethal control action following confirmed livestock depredations on tribal lands in the Wind River Reservation in 2017 (Table 3).

## Wolf Population Monitoring in Yellowstone National Park

### *Capture and Radio-collaring*

Twenty-six wolves in 8 packs were captured and collared in 2017. Ten of these were captured to replace old or malfunctioned transmitters. In addition to marking them, a number of measurements and biological samples were taken. Thirteen females and 13 males were captured; 3 were old adults (>6 years old), 11 were adults (2-5 years old), 5 were yearlings, and 7 were pups (<12 months).

### *Population and Breeding Pair Status*

There were ≥97 wolves in ≥11 packs (≥3 breeding pairs) living primarily in Yellowstone National Park at the end of December 2017 (Table 3). Overall, wolf numbers have fluctuated little from 2009 to 2017 (83-108 wolves) while breeding pairs have typically been 2 to 3 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 National Park 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. About $300,000 was spent on monitoring and managing wolves in Yellowstone National Park in 2017.

### *Mortality*

Five wolves died in Yellowstone National Park in 2017; 1 was killed by other wolves, 1 kicked and killed by an ungulate, 1 died of canine distemper virus, 1 was illegally shot inside the park boundary and had to be euthanized by park staff, and 1 died of unknown natural causes (necropsy was delayed due to remoteness and exact cause of death could not be determined). Four of the wolves that died were radio-collared and were all old adults (2 were 6.5 and 2 were 8 years old). The wolf that died after being kicked several times by an ungulate was a female pregnant with 5 pups (3 males, 2 females) that all died. They were within a week of birth. In addition, staff recorded 6 wolf deaths from packs assigned to Yellowstone National Park that occurred outside the park; all were human-caused. Five were harvested during Montana's wolf hunting season (1 old adult, 3 adults, and 1 pup) and 1 wolf from the Snake River pack (an adult) was taken during Wyoming's wolf hunting season

### *Disease Monitoring*

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 1 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's group in early May, Junction Butte in late May, Lamar Canyon in late May, and Mollie's in late June. Three of these 4 packs lived on Yellowstone National Park's Northern Range, where previous outbreaks of distemper (1999, 2005, and 2008) have primarily affected pup survival. The Mollie's pack also visits the Northern Range and interacts with resident wolves, which may explain the possible source of disease contraction in this interior pack. Yellowstone Wolf Project personnel 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 distemper 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.

# WOLF MANAGEMENT

## SUMMARY OF WOLF MANAGEMENT STATEWIDE

In 2017, the Wyoming Game and Fish Department instituted a wolf hunting season with the biological objective to reduce the wolf population by approximately 24% in the WTGMA. A mortality quota of 44 wolves was divided between 12 hunt areas in WYO. Wolf hunting seasons were open from October 1, 2017 through December 31, 2017 with the exception of hunt area 12, which opened on October 15, 2017. A total of 43 wolves were legally harvested and 1 wolf was illegally killed during the hunting season. Wolves could also be taken in any legal manner in WYO where they are designated as predatory animals. Thirty-three wolves were taken under predatory animal status in 2017.

Wolves were confirmed to have killed 194 head of livestock (113 cattle and 81 sheep) and 1 dog statewide in Wyoming in 2017. An additional 5 cattle were injured by wolves but survived. Of the 29 packs involved in ≥1 depredation statewide, 21 packs were involved in ≥2 depredations and 19 packs were involved in ≥3 depredations. Control efforts lethally removed 62 depredating wolves statewide in an effort to reduce livestock losses due to wolves. A combined minimum of $528,328 was spent on wolf damage management in WYO by Wildlife Services ($216,714) and livestock depredation compensation by the Wyoming Game and Fish Department ($311,614) in 2017.

## Wolf Management in WYO

### *Hunting*

*Wolf Hunting Season Background:* The Wyoming Game and Fish Department implemented regulated wolf hunting as a population management tool in WYO following removal of Endangered Species Act protections for wolves in April 2017. Wolf hunting regulations (Chapter 47) for 2017 were approved in July 2017 by the Wyoming Game and Fish Commission. Chapter 47 governs wolf hunting in WYO and was part of the management framework evaluated and approved by the U.S. Fish and Wildlife Service during the delisting process. Chapter 47 outlined specific hunt areas, mortality quotas, season dates, harvest reporting requirements, and other wolf hunting regulations in WYO and where and when wolves were designated as trophy game animals (the WTGMA and the Seasonal WTGMA from October 15 to the last day of February of the subsequent year). Trapping was not legal for wolves designated as trophy game animals in 2017. There were no hunting season dates or quotas for wolves occupying areas where and when they were designated as predatory animals and, accordingly, wolves could be hunted in any legal manner in these areas. Chapter 47 included reporting requirements for wolves taken in areas where and when they are designated as predatory animals and required that radio-collars, if present, be surrendered to Wyoming Game and Fish Department regardless of trophy game or predatory animal designation.

The Wyoming Gray Wolf Management Plan required the Wyoming Game and Fish Department to delineate hunt areas smaller than the 4 hunt areas proposed in WYO in 2008. This approach focuses harvest in areas where wolf conflicts with livestock and/or ungulate herds may be occurring while allowing for lower levels of harvest in core population areas where conflicts are

minimal. Eleven hunt areas were delineated throughout the WTGMA to spatially distribute wolf mortality and hunter activity, and the Seasonal WTGMA was included as a 12th hunt area (Figure 5). The Wyoming Game and Fish Commission approved wolf hunting seasons were in conjunction with fall big game hunting seasons. The majority of big game seasons opened during mid-September and many elk seasons did not close until mid-November to late December, so wolf hunting seasons were set from October 1 through December 31, 2017. The wolf hunting season in hunt area 12 (the Seasonal WTGMA) differed from the other 11 hunt areas by opening on October 15 (the date wolves changed from predatory animal to trophy game animal designation as prescribed by Wyoming state statute) but ended on December 31, 2017 like the other 11 hunt areas. Wolf harvest was limited by mortality quotas established for each hunt area using a general license hunting structure. Legal and illegal wolf harvest during the open hunting season counted toward these mortality quotas. The season for each hunt area closed when the mortality quota was met or at the season end date, whichever occurred first.

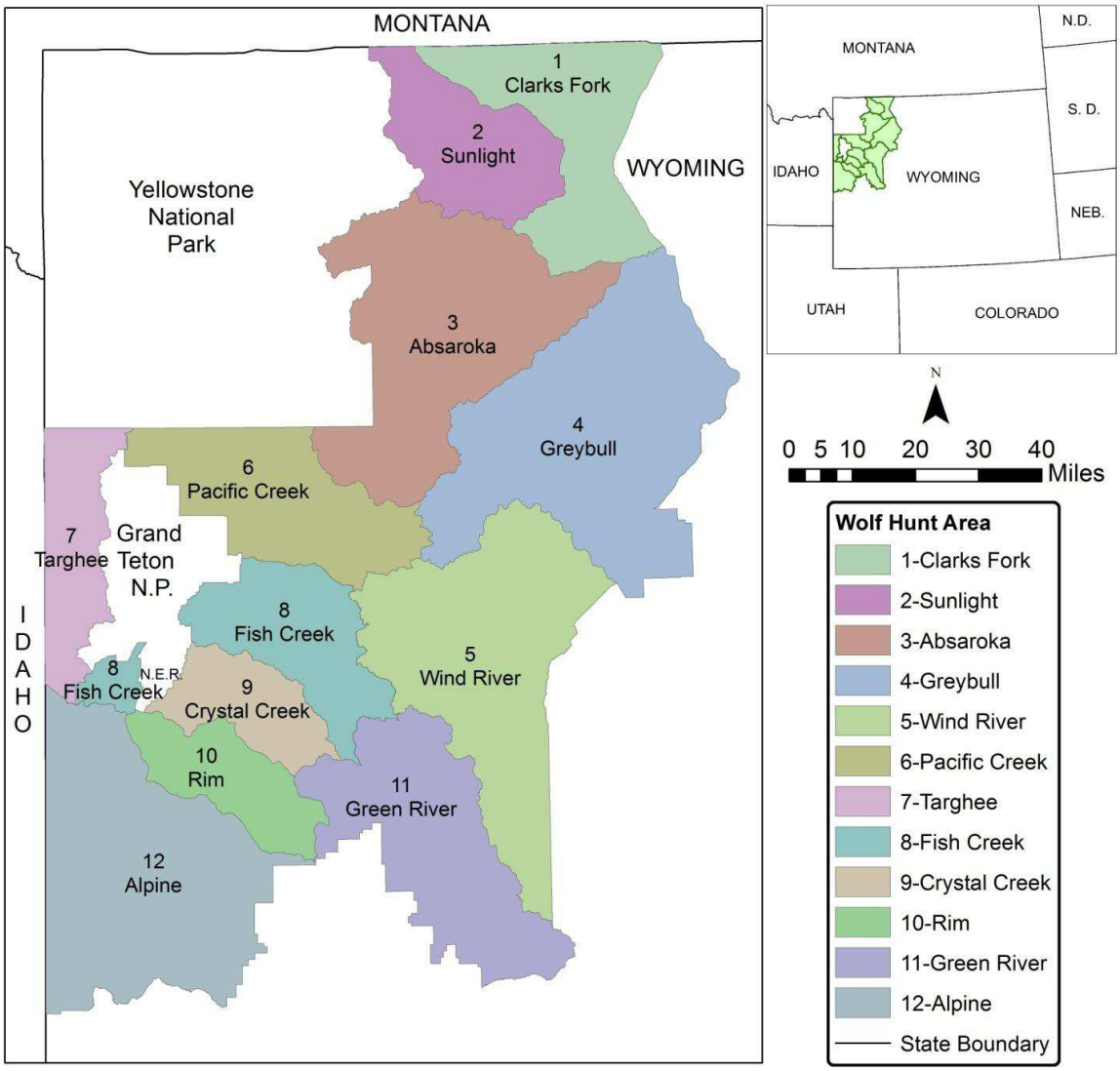



**Figure 5.** Wolf hunt areas for the 2017 wolf hunting seasons in the Wolf Trophy Game Management Area (WTGMA) (hunt areas 1-11) and Seasonal WTMGA (hunt area 12) in northwest Wyoming.

Total wolf mortality quotas were set to reduce the WTGMA wolf population from ≥210 wolves at the start of 2017 to approximately 160 wolves and 14 breeding pairs at the end of 2017. Wolf mortality quotas were determined using data collected annually on wolf population dynamics and human-caused mortality in the WTGMA. The estimated human-caused mortality rate required to stabilize wolf population growth, natural mortality, estimated recruitment rates, and estimated non-hunting human-caused mortality rates (e.g., mortalities from control actions, illegal kills outside the hunting season, vehicle kills, etc.) were considered in the mortality quota calculation. The Wyoming Game and Fish Department predicted the population would be reduced in the WTGMA from 210 wolves at the beginning of 2017 to approximately 160 wolves at the end of 2017 if 42.8% of the wolves present at the beginning of 2017 died from all human-caused mortality, as predicted. The average non-hunting human-caused mortality rate since 2008 (22.8%) was then subtracted from 42.8% to obtain a 20.0% mortality rate, which equaled a total mortality quota of 42 wolves when applied to the minimum wolf population estimate of ≥210 wolves present in the WTGMA at the beginning of 2017. The total mortality quota of 42 wolves was sub-divided among the 11 hunt areas in the WTGMA. An additional 2 wolves were included into the total mortality quota to be applied to hunt area 12, the Seasonal WTGMA.

*Wolf Hunting in the WTGMA/Seasonal WTGMA:* A total of 2,527 wolf hunting licenses (2,334 resident and 193 nonresident licenses) were sold for the 2017 wolf hunting season, similar to the number sold in 2013 (2,152) and roughly half the number of licenses sold in 2012 (4,492 licenses). A total of 44 wolves out of the 44 wolf mortality quota were taken during open wolf hunting seasons in the 12 hunt areas, 1 of which was illegally killed during the hunting season and was applied to the mortality quota (Table 4). Nine of the 43 legally hunted wolves (14.3% of wolves taken) wore a functioning radio-collar, which was less than the proportion of radio-collared wolves in the population (24.2% of the WYO population was collared prior to the 2017 hunting season) suggesting that there was not hunter selection for collared wolves. All hunters who legally harvested a wolf complied with reporting and registration requirements, including submission of a genetics sample.

Ten of the 12 hunt areas closed prior to the December 31, 2017 closing date for the hunting season (Table 4). Mortality quotas in 3 hunt areas (2, 5, and 11) were exceeded by 1 wolf when 2 wolves were taken on the same day when only 1 wolf was remaining on the mortality quota (Table 4). The quota was not filled in hunt areas 7 and 12 when the season closed on December 31, 2017. Harvest was recorded in 20 of 36 packs (56%) that regularly use the 12 hunt areas and 1 wolf from unknown pack origin (Table 1). Of the 20 packs that had ≥1 wolf taken in the hunt, 8 packs had 1 wolf taken (40%), 7 packs had 2 wolves taken (35%), and 5 packs had ≥3 wolves taken (25%). Harvest occurred primarily in October (31 wolves, 73%) during elk hunting seasons, declined in November (1 wolf, 2%) and increased again in December (11 wolves, 25%) prior to the end of the hunting season on December 31, 2017. More females than males (17 males vs. 26 females) and more gray than black colored wolves were taken (26 gray vs. 17 black) during the hunt. A similar proportion of adult (>2 years old), subadult (1-2 years old) and juvenile (<1 year old) wolves were taken (17 adults vs. 13 subadults vs. 13 pups).

*Development of 2018 Wolf Hunting Seasons:* Evaluation of the 2017 wolf hunting season data demonstrated the hunting strategy in 2017 did not reduce the wolf population as intended from ≥210 wolves to approximately 160 wolves (6% decline vs. 24% predicted decline). The end of

**Table 4.** Summary of hunting seasons and wolves taken in Wyoming outside Yellowstone National Park and the Wind River Reservation (WYO) in 2017; available on the Wyoming Game and Fish Department website at: https://wgfd.wyo.gov/WGFD/media/content/PDF/Hunting/WOLF_SUMMARY.pdf

| WGFD WOLF HUNTER HARVEST SUMMARY 2017 | | | | | | 2/7/2018 8:30 AM |
|---|---|---|---|---|---|---|
| | HUNT AREA | QUOTA FROM REGS | SEASON DATES GENERAL | HARVEST COUNTED TOWARDS QUOTA *1 | AREA STATUS | DATE/TIME AREA CLOSED |
| | 1 | 2 | October 1 - December 31 | 2 | CLOSED | 10/7 @ 920 AM |
| | 2 | 4 | | 5 | CLOSED | 10/20 @ 420 PM |
| | 3 | 6 | | 6 | CLOSED | 12/10 @ 1230 PM |
| | 4 | 5 | | 5 | CLOSED | 10/4 @ 800 PM |
| | 5 | 6 | | 7 | CLOSED | 12/3 @ 1015 AM |
| | 6 | 3 | | 3 | CLOSED | 12/21 @ 900 PM |
| | 7 | 1 | | 0 | CLOSED | 12/31 per Regulation |
| | 8 | 7 | | 7 | CLOSED | 12/30 @ 1030 AM |
| | 9 | 2 | | 2 | CLOSED | 10/25 @ 1130 AM |
| | 10 | 3 | | 3 | CLOSED | 10/15 @ 230 PM |
| | 11 | 3 | | 4 | CLOSED | 10/1 @ 900 PM |
| | 12 | 2 | Oct 15 - Dec 31 | 0 | CLOSED | 12/31 per Regulation |
| | Total 2017 Trophy Quota | 44 | Total 2017 Trophy Harvest | 44 | | |
| STATE WIDE | PREDATORY | No Quota | Total 2017 Predatory Animal Take *2 | 33 | | |

*1 All legal harvest or illegal human-caused gray wolf deaths that occur during an open hunting season will apply to the quota.

*2 Total harvest for Gray Wolves designated as predatory animals.

2016 population estimate for the WTGMA (≥210 wolves) as reported by the U.S. Fish and Wildlife Service in their published 2016 annual report was the basis for which the 2017 wolf hunting strategy was developed. However, in 2017 the Wyoming Game and Fish Department documented at least19 wolves in 4 packs in the WTGMA that existed on December 31, 2016 but were not included in the 2016 end of year population count (Arrow Mountain, Coyote Meadows, Rattlesnake, and Windy Mountain; Figure 1, Table 1), which resulted in more conservative hunt area limits based on the actual number of wolves in the WTGMA, and therefore a higher number of post-hunt wolves than expected. Using these revised data, the actual reduction in the WTGMA wolf population between 2016 and 2017 was 14% from ≥229 wolves to ≥198 wolves. The wolf population also demonstrated a higher resilience to human-caused mortality in 2017 than predicted (30.6% human-caused mortality to stabilize the population in 2017 vs. 18.9% predicted), which also offset the impact of hunting mortality (Figure 6). Resilience to human-

caused mortality will continue to be estimated with the best available data for the wolf population in the WTGMA, understanding all wildlife populations are dynamic and can only be imperfectly predicted. Wolf hunting regulations are revised annually using an adaptive approach that includes re-evaluation of all data collected during the previous year, internal review within the Wyoming Game and Fish Department and a public input process. These data and other commitments made in the Wyoming Gray Wolf Management Plan and regulatory documents will be used to develop appropriate and scientifically defensible wolf hunting seasons in 2018 that will ensure the wolf population remains above minimum delisting criteria.

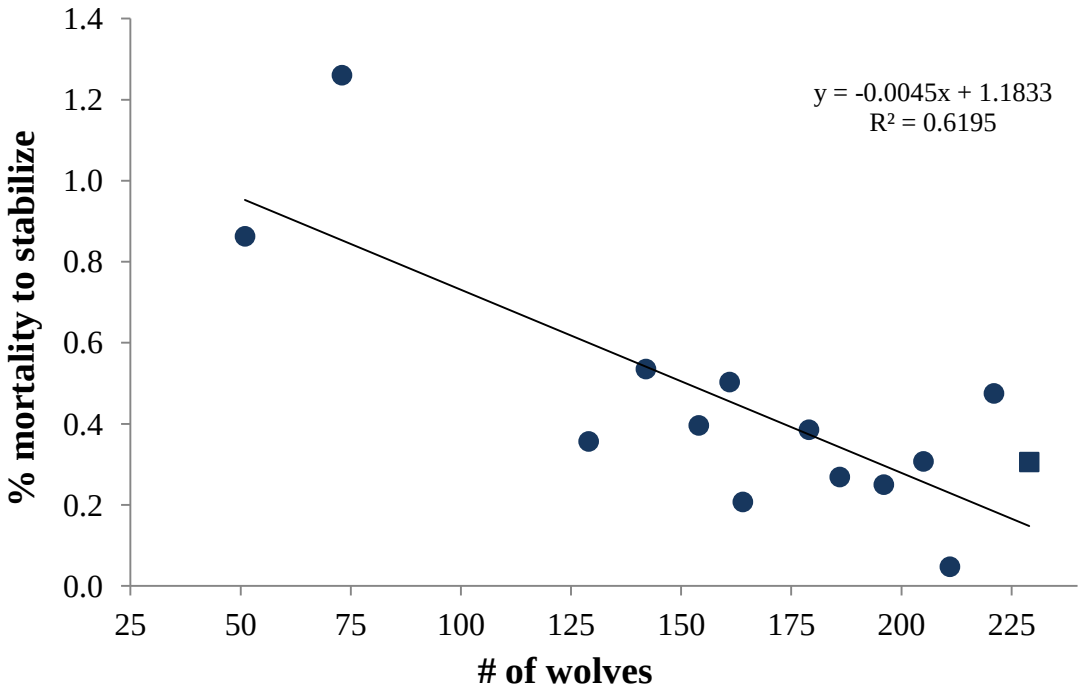



**Figure 6.** Relationship between the minimum number of wolves in the Wolf Trophy Game Management Area (WTGMA) and the percent human-caused mortality that would have resulted in stabilization of the wolf population from start to end of the calendar year from 2004-2017. The "■" indicates the data point for 2017.

*Wolf Hunting Outside the WTGMA/Seasonal WTGMA:* A total of 33 wolves were taken under predatory animal designation in 2017 (Tables 1, 2, and 4). All persons who took wolves under predatory animal designation complied with reporting requirements. Wolves killed as predatory animals were taken using firearms (29 wolves, 88%), traps (3 wolves, 9%), and archery equipment (1 wolf, 3%). Tissue samples were voluntarily submitted for 26 of 33 (79%) wolves taken as predatory animals and will be included in the evaluation of genetic interchange between recovery areas. A similar proportion of male and female wolves (17 males vs. 16 females) were taken as predatory animals and more gray colored wolves were taken than black (20 gray vs. 13 black). Most wolves taken as predatory animals were adults and subadults (13 adults vs. 14 subadults vs. 5 pups; age was not reported for 1 wolf), which is expected because the majority of wolves present in largely unsuitable habitat outside the WTGMA/Seasonal WTGMA are likely to be single wolves or members of small, newly established packs.

***Livestock Depredation***

During 2017, reported livestock depredations in the WTGMA or Seasonal WTGMA were investigated by the Wyoming Game and Fish Department or Wildlife Services. Wildlife Services conducted investigations for reported livestock depredation in the year-round predatory animal area. Only confirmed depredations were documented in this report consistent with Wyoming Game and Fish Commission Chapter 28 Regulation Governing Big or Trophy Game Animal or Game Bird or Gray Wolf Damage Claims (Chapter 28) requiring confirmed evidence at the scene or on the livestock carcass indicating wolves were more likely than not responsible for the death or injury of the individual livestock. All reported livestock damage is investigated in the WTGMA and Seasonal WTGMA and provides annual comparisons for the number of confirmed wolf depredations occurring in these areas. In these areas, all suspected livestock depredation caused by wolves that is discovered is expected to be reported because verification is required to qualify for compensation or for management actions to be initiated. Confirmed wolf depredations where wolves are designated as predatory animals year-round as presented in this report should be considered a minimum.

In 2017, wolves in WYO were responsible for killing 191 head of livestock and 1 dog (Figure 7, Tables 1 and 5). Confirmed livestock depredations included 110 cattle (78 calves, 31 cows/yearlings, and 1 bull), and 81 sheep (41 adults and 40 lambs; Figure 7, Tables 1 and 5). An additional 5 cattle were confirmed to have been injured by wolves but recovered from their injuries. Confirmed cattle depredations were lower and sheep depredations were similar in 2017 compared to 2016 (Figure 7, Table 5). Management actions in response to confirmed livestock depredations included trapping and radio-collaring wolves, intensive monitoring, lethal removal through agency control actions, non-lethal depredation prevention measures, and issuance of 35 lethal take permits to livestock producers (22 initial permits, 13 of which were renewed due to continued livestock damage). Sixty-one wolves were killed in response to livestock depredation; 49 in agency-directed lethal control actions, 10 under the authority of lethal take permits, and 2 were killed for defense of private property as provided in state statute and regulation and federal Endangered Species Act 10j rules (Tables 1 and 2). Non-lethal control, in the form of lighting and scare devices, was implemented on one private land ranch to prevent depredation. In addition to monies spent by the Wyoming Game and Fish Department, Wildlife Services spent $216,714 to investigate depredations and conduct control actions.

**Table 5.** Confirmed livestock depredations and number of wolves killed in control actions in Wyoming outside Yellowstone National Park and the Wind River Reservation (WYO) from 2005-2017.

| Depredations | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Cattle | 54 | 123 | 55 | 41 | 20 | 26 | 35 | 44 | 40 | 56 | 72 | 154 | 110 |
| Sheep | 27 | 38 | 16 | 26 | 195 | 33 | 30 | 112 | 33 | 6 | 62 | 88 | 81 |
| Dogs | 1 | 1 | 2 | 0 | 7 | 0 | 1 | 3 | 1 | 0 | 0 | 0 | 1 |
| Goats | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| Horses | 1 | 0 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 0 |
| Total Depredations | 83 | 162 | 74 | 67 | 222 | 60 | 67 | 160 | 75 | 62 | 134 | 243 | 191 |
| Wolves Removed | 41 | 44 | 63 | 46 | 31 | 40 | 36 | 43 | 33 | 37 | 54 | 113 | 61 |

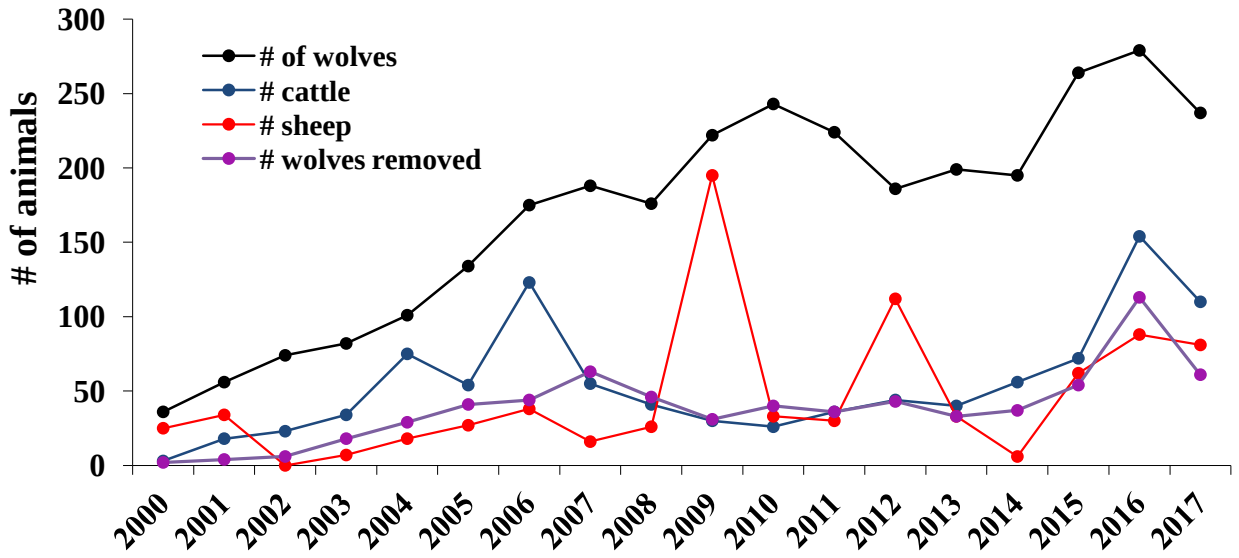



**Figure 7.** Minimum number of wolves, number of confirmed cattle and sheep depredations, and number of wolves removed in lethal control actions in Wyoming outside Yellowstone National Park and the Wind River Reservation (WYO) from 2000-2017.

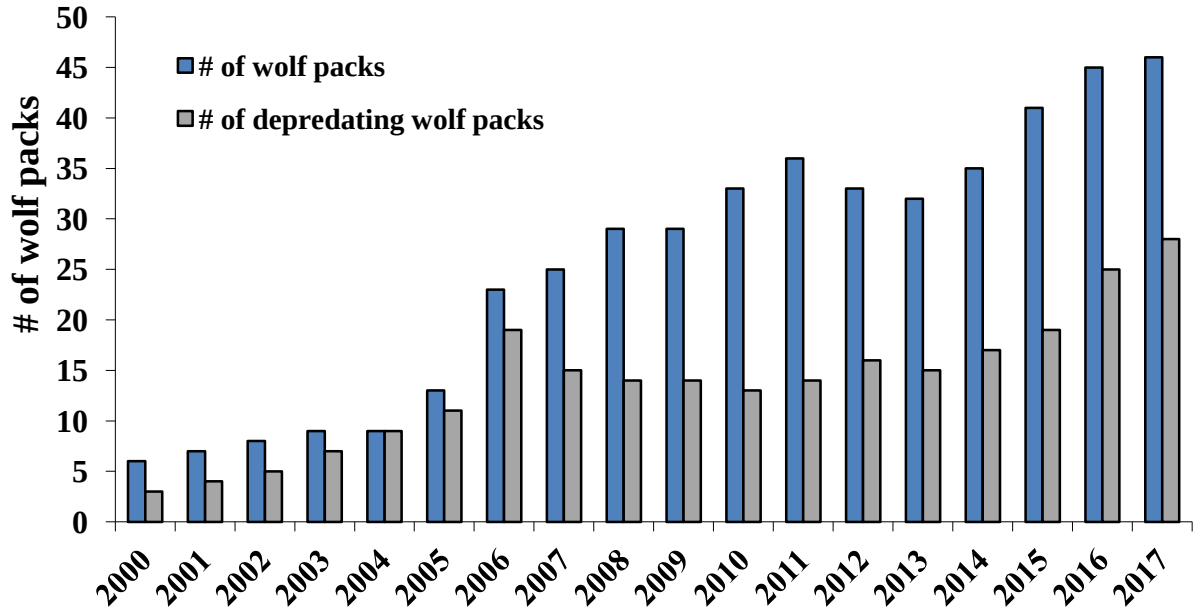



**Figure 8.** Minimum number of wolf packs and number of wolf packs that were involved in ≥1 confirmed livestock depredation in Wyoming outside Yellowstone National Park and the Wind River Reservation (WYO) from 2000-2017.

*Number of Packs Involved in Confirmed Depredations:* Twenty-eight packs (61% of 46 packs that existed in 2017) in WYO were involved in ≥1 depredation in 2017 (Figure 8, Table 1). Of the 28 packs involved in ≥1 depredation, 20 packs (71%; 43% of packs in WYO) were involved in ≥2 depredations; and 18 packs (57%; 35% of packs in WYO) were involved in ≥3 depredations. A total of 25 packs were involved in confirmed cattle depredation, of which the Ferris Mountain and Houlihan packs were responsible for 26% of total confirmed cattle depredations (Table 1). The Greys River pack was responsible for 44% of sheep depredations

(36 sheep), the remainder of which were primarily from miscellaneous wolves in the predatory animal area (Table 1). All of the packs responsible for sheep depredation occupied areas with high domestic sheep numbers outside the WTGMA.

*Seasonal Trend in Livestock Depredations:* Cattle depredation began in March, had an unusual spike in April, peaked in mid-summer then declined toward autumn (Figure 9). July and August saw the highest cattle depredation while the month of September was considerably lower in 2017 than in 2015 and 2016 (Figure 9). Sheep depredations began in March 2017 and continued in May and June. No depredations were documented during the month of July in 2017, unlike 2015 and 2016 (Figure 10). Sheep depredations peaked in August (48 killed), but quickly tapered off in September. The seasonal trend in depredations was similar to other years and followed the pattern of open range grazing where livestock are distributed over large grazing allotments that overlap wolf distribution in northwest Wyoming during the summer and autumn.

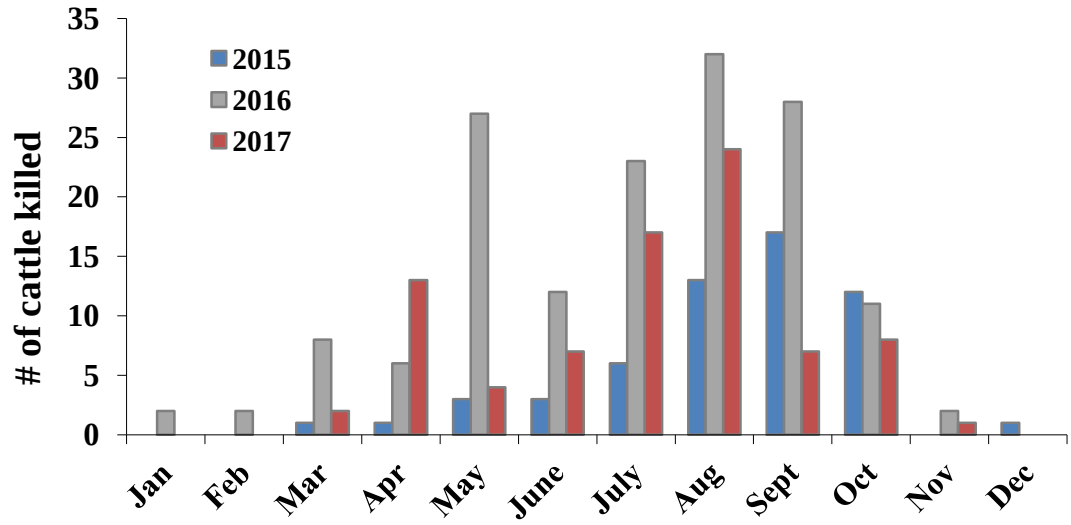



**Figure 9.** Number of confirmed cattle depredations per month by wolves in Wyoming outside Yellowstone National Park and the Wind River Reservation (WYO) from 2015-2017.

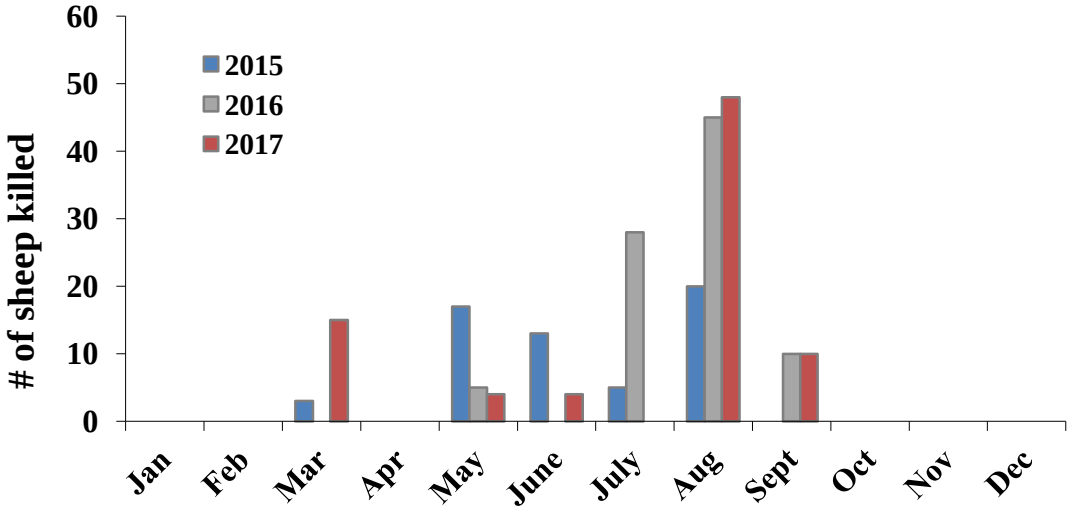



**Figure 10.** Number of confirmed sheep depredations per month by wolves in Wyoming outside Yellowstone National Park and the Wind River Reservation (WYO) from 2015-2017.

*Location of Livestock Depredations:* Land ownership is recorded for all instances of confirmed livestock depredation by wolves in the WTGMA and Seasonal WTGMA as part of routine investigation of reported wolf conflicts. Land ownership is not consistently recorded for livestock depredation in areas where wolves are designated as predatory animals year-round and are not included in this summary. In 2017, 65% (77 livestock; 41 cattle and 36 sheep) of all confirmed wolf depredation in the WTMGA and Seasonal WTGMA were on public land and 35% (42 livestock, all cattle) of all depredations were on private land (Figure 11). Cattle depredations were split nearly even between public land and private property (Figure 11). All confirmed sheep depredations in 2017 in the WTGMA and Seasonal WTGMA occurred on public land (Figure 11). Thirteen additional sheep depredations from the predatory animal area were known to be on private property, but land ownership for the remainder was not recorded.

In 2017, confirmed cattle depredations occurred in all but 1 wolf hunt area (Table 6). Confirmed sheep depredation occurred in the predatory animal area (56% of confirmed sheep depredation), and in wolf hunt area 12 (44% of confirmed sheep depredation), which is the Seasonal WTGMA (Table 6).

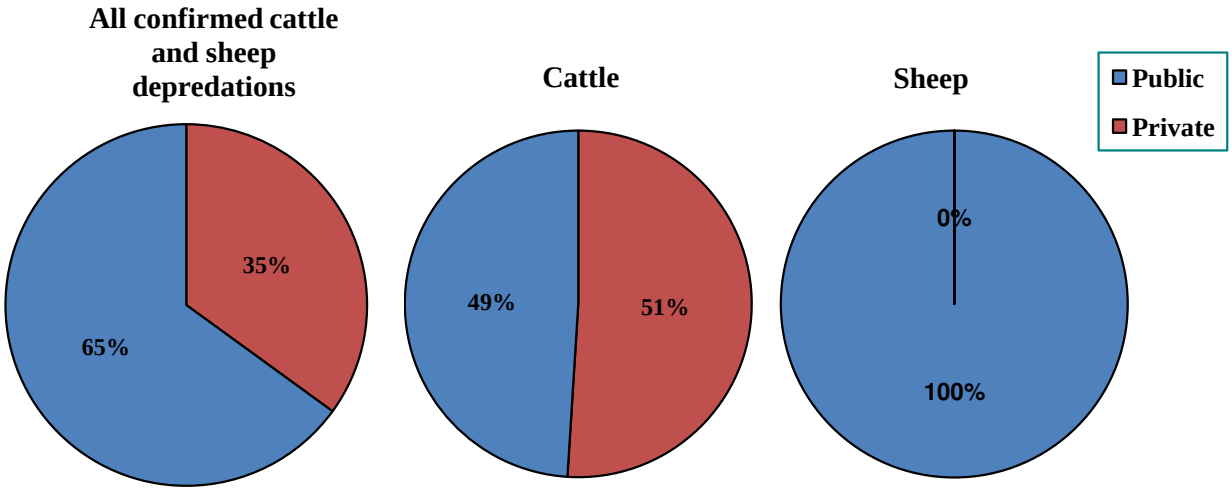



**Figure 11.** Land status where confirmed cattle and sheep depredation by wolves occurred in the Wolf Trophy Game Management Area (WTGMA) and Seasonal WTGMA in 2017.

**Table 6**. Confirmed cattle and sheep depredations by wolves in Wyoming outside Yellowstone National Park and the Wind River Reservation (WYO) by wolf hunt area ("WHA") and in areas where wolves are designated as predatory animals year-round ("Pred") in 2017.

| WHA | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | Pred | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Cattle | 7 | 2 | 13 | 11 | 19 | 0 | 2 | 13 | 3 | 3 | 9 | 1 | 27 | 110 |
| Sheep | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 36 | 45 | 81 |
| Total | 7 | 2 | 13 | 11 | 19 | 0 | 2 | 13 | 3 | 3 | 9 | 37 | 72 | 191 |

*Compensation for Livestock Depredations:* The Wyoming Game and Fish Department paid $311,614 to compensate livestock producers who lost livestock to wolves during 2017 within the WTGMA and Seasonal WTGMA. Chapter 28 and state statute authorizes compensation only for damage by the Wyoming Game and Fish Department that occurs in the WTGMA and Seasonal WTGMA. Livestock owners who have confirmed wolf depredation on livestock outside the WTGMA and Seasonal WTGMA do not qualify for compensation from the Wyoming Game and Fish Department unless their private land is bisected by the WTMGA or Seasonal WTGMA boundary. Livestock depredations in areas of the state where wolves are designated as predatory animals year-round are not eligible for compensation by the Wyoming Game and Fish Department, but may be eligible for compensation by the Wyoming Department of Agriculture or under the Federal Farm Bill.

***Unacceptable Impacts to Ungulates or Elk Feedgrounds***

Under the Wyoming Gray Wolf Management Plan, state statute, and Wyoming Game and Fish Commission regulation Chapter 21, the Wyoming Game and Fish Department may lethally remove wolves when it is determined that "wolf predation is causing an unacceptable impact on a wild ungulate population or herd" or when a "wolf-wild ungulate conflict has occurred at any state operated elk feedground." An "unacceptable impact on a wild ungulate population or herd" is defined in Chapter 21 as:

> "Unacceptable impact on a wild ungulate population or herd" means any decline in a wild ungulate population or herd that results in the population or herd not meeting the Commission population management goals, objectives or recruitment levels established for the population or herd. The Department shall determine whether a decline in a wild ungulate population or herd constitutes an "unacceptable impact" and whether wolf predation is a significant factor causing the "unacceptable impact" based upon the best scientific data and information available.

In addition, under Chapter 21, wolves may be lethally removed for conflicts caused at state-operated elk feedgrounds only "when a gray wolf or wolves displace elk from a feedground and it results in one of the following conflicts:"

1. Damage to private stored crops by displaced elk; or,
2. Elk co-mingling with domestic livestock; or,
3. Displacement of elk from a feedground onto a highway right of way causing human safety concerns.

No agency directed lethal removal actions were taken in 2017 as there was no documentation of unacceptable impacts to ungulates or elk feedgrounds. Monitoring and analyses of potential impacts to ungulate populations remain an integral part of ongoing management of wolves and their prey in WYO.

**Wolf Management on the Wind River Reservation**

Currently, wolves are classed as a trophy game animal on the Wind River Reservation for which there is no open season and legal take can only occur to defend life or property. Reported

livestock depredations by wolves are investigated by the U.S. Fish and Wildlife Service Lander Fish and Wildlife Conservation Office or the Eastern Shoshone and Northern Arapaho Tribal Fish and Game Department. One cow and 2 calves were confirmed to have been killed by the St. Lawrence pack in 2017 (Table 3). One wolf was lethally removed in response to these depredations (Table 3). Ten additional dead cattle were investigated in 2017 but were not confirmed to have been caused by wolves.

### Wolf Management in Yellowstone National Park

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.

Wyoming, Idaho, and Montana conducted wolf hunts outside of Yellowstone National Park and 6 wolves from packs that primarily live within the boundaries of Yellowstone National Park were legally harvested; 5 in Montana and 1 from the Snake River pack in Wyoming.

## OUTREACH

### Outreach in WYO

In 2017, Wyoming Game and Fish Department personnel gave numerous formal presentations on wolf biology, monitoring, and management to the general public, special interest groups, civic organizations, other agencies and associations, and at scientific conferences. Outreach to the public in WYO included 9 public information gathering meetings discussing proposed regulatory changes for wolves in WYO and 11 Living in Large Carnivore Country workshops across western Wyoming where information on wolf biology and ecology and large carnivore safety was presented. Wyoming Game and Fish Department personnel met with multiple conservation and sportsmen's non-government organizations and several interested members of the public to discuss the status of the wolf population in Wyoming and wolf hunting season proposals. Wyoming Game and Fish personnel were interviewed for many magazine, newspaper, and television feature stories. As part of normal wolf monitoring and management activities, Wyoming Game and Fish personnel interacted with members of the public on a daily basis and made every effort to make these interactions positive and informative to increase the public's involvement and understanding of wolf monitoring and management throughout Wyoming.

### Outreach in Yellowstone National Park

Yellowstone Wolf Project staff gave 285 formal talks, participating in 65 interviews, and giving 825 informal talks in the field. Talks were at both scientific conferences and to general audiences. Interviews were to all forms of media.

## CONTRIBUTORS

Many personnel contributed to the content of the 2017 Wyoming Wolf Population Monitoring and Management Annual Report. Thanks go to all those who contributed.

Information presented in this report for the wolf population in WYO:

- Wyoming Game and Fish Department: Ken Mills and Zach Gregory collected data and edited the report; Clint Atkinson, Dan Bjornlie, Ron Blanchard, Mike Boyce, Justin Clapp, Colby Clark, Brian DeBolt, Luke Ellsbury, Andy Johnson, Ryan Kindermann, Dusty Lasseter, Phil Quick, Sean Ryder, Sam Stephens, Dan Thompson, and Zach Turnbull
- Grand Teton National Park: Sarah Dewey and John Stephenson
- U.S. Fish and Wildlife Service: Scott Becker, Steve Stoinski, and Bo Stone
- Wildlife Services: Mike Foster, Vivian Meek, Rod Merrell, and Mike Burrell

Information presented in this report for the wolf population on the Wind River Reservation:

- U.S. Fish and Wildlife Service Lander Fish and Wildlife Conservation Office: Pat Hnilicka
- Eastern Shoshone and Northern Arapaho Tribal Fish and Game Department: Art Lawson and Ben Snyder

Information presented in this report for the wolf population in Yellowstone National Park:

- National Park Service: Doug Smith, Dan Stahler, Erin Stahler, Matthew Metz, Kira Cassidy, Brenna Cassidy, Lisa Koitzsch, Lizzie Cato, and Rick McIntyre

## ACKNOWLEDGEMENTS


### WYO

We appreciate safe and outstanding piloting from Mark Packila of Wildlife Air. We also thank Native Range Capture Services for their wolf capture expertise. Numerous agencies and agency personnel contributed to the monitoring program. We thank many regional Wyoming Game and Fish Department wardens and biologists who were instrumental in collecting wolf monitoring data. We thank personnel at the following agencies for their assistance in wolf monitoring and management: Bridger-Teton National Forest; Shoshone National Forest; National Elk Refuge; Grand Teton National Park; and Bureau of Land Management. We also thank members of the public and private landowners who assisted the Wyoming Game and Fish Department wolf monitoring and management program in WYO. We recognize a successful program needs a strong base of support and to all of the above we are indebted.

**Wind River Reservation**

We gratefully acknowledge the following for their assistance with wolf conservation: Mike Mazur, and Laurie Connell (U.S. Fish and Wildlife Service); Justin Friday and Wilma Wagon (Eastern Shoshone and Northern Arapaho Tribal Fish and Game Department).

**Yellowstone National Park**

We thank the paid and volunteer staff who assisted in monitoring wolves in Yellowstone National Park in 2017. We continue to be impressed by and thank the many interested people who come forward every year. First and foremost are the Wolf Project staff including volunteers, whom without we would accomplish much less. The Yellowstone National Park wolf watching community over the years has always helped when they can and to them we are appreciative. We also thank the many generous individuals, foundations and organizations that have provided millions in grants through Yellowstone Forever to the Wolf Project since 1996.

## LITERATURE CITED

Jimenez, M.D., E.E. Bangs, C. Sime, and V.J. Asher. 2010. Sarcoptic mange found in wolves in the Rocky Mountains in western United States. Journal of Wildlife Diseases. 46:1120-1125.

Mitchell, M.S., D.E. Ausband, C.A. Sime, E.E. Bangs, J.A. Gude, M.D. Jimenez, C.M. Mack, T.J. Meier, M.S. Nadeau, and D.W. Smith. 2008. Estimation of successful breeding pairs for wolves in the northern Rocky Mountains, USA. Journal of Wildlife Management. 72:881-891.

U.S. Fish and Wildlife Service. 2012. Removal of the Gray Wolf in Wyoming from the Federal List of Endangered and Threatened Wildlife and Removal of the Wyoming Wolf Population's Status as an Experimental Population. Federal Register vol. 77, no. 175:55530-55604.

U.S. Fish and Wildlife Service, National Park Service, Wyoming Game and Fish Department, Eastern Shoshone Tribe, Northern Arapaho Tribe, and USDA-APHIS Wildlife Services. 2017. Wyoming Wolf Recovery 2016 Annual Report. U.S. Fish and Wildlife Service, Wyoming Ecological Services Field Office, 5353 Yellowstone Road, Suite 308A, Cheyenne, WY 82009.