Montana Gray Wolf Conservation and Management 2014 Annual Report

Liz Bradley in 2005 with wolf SW20M. Liz was MFWP's southwest Montana wolf specialist from 2001-2014 and is now MFWP's Missoula area wildlife biologist. Her hard work, even temper, and dedication to Montana's wildlife is exemplary.

This is a cooperative effort by Montana Fish, Wildlife & Parks, USDA Wildlife Services, Glacier National Park, Yellowstone National Park, Blackfeet Nation, and The Confederated Salish and Kootenai Tribes

This report presents information on the status, distribution, and management of wolves in the State of Montana, from January 1, 2014 to December 31, 2014.

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MONTANA EXECUTIVE SUMMARY

Wolf recovery in Montana began in the early 1980's. Gray wolves increased in number and expanded their distribution in Montana because of natural emigration from Canada and a successful federal effort that reintroduced wolves into Yellowstone National Park and the wilderness areas of central Idaho. The U.S. Fish and Wildlife Service (USFWS) approved the Montana Gray Wolf Conservation and Management Plan in early 2004.

In April of 2011, a congressional budget bill directed the Secretary of the Interior to reissue the final delisting rule for Northern Rocky Mountain wolves originally published in April of 2009. On May 5, 2011 the USFWS published the final delisting rule designating wolves throughout the Designated Population Segment, except Wyoming, as a delisted species. Wolves in Montana became a species in need of management statewide under Montana law; state rules and the state management plan took full effect. Using a combination of federal funds and license dollars, Montana Fish, Wildlife and Parks (FWP) implements the state management plan by monitoring the wolf population, directing problem wolf control and take under certain circumstances, coordinating and authorizing research, regulating sport harvest, and leading wolf information and education programs.

The minimum count of Montana wolves decreased by 73 from 627 in 2013 to 554 in 2014. A total of 134 packs of 2 or more wolves were verified in Montana for 2014. Thirty-four packs, seven more than in 2013, qualified as a breeding pair according to the federal recovery definition of an adult male and female with two surviving pups on December 31. In northwest Montana we verified 338 wolves in 91 packs, 17 of which were breeding pairs, while in western Montana we verified 94 wolves in 20 packs, 6 of which were breeding pairs, and in southwest Montana we verified 122 wolves in 23 packs, 11 of which were breeding pairs.

USDA Montana Wildlife Services (WS) confirmed 42 livestock losses to wolves including 35 cattle, 6 sheep and 1 horse in calendar year 2014 compared to 78 total confirmed losses in 2013. Additional losses (both injured and dead livestock) most certainly occurred, but could not be confirmed. Most depredations occurred on private property. The Montana Livestock Loss Board paid $72,268 for 54 head of livestock that were verified by WS as either confirmed or probable death loss due to wolves in 2014. Fifty-seven wolves were killed to reduce the potential for further depredations. Of the 57, seven were killed by private citizens, either by kill permit or under state regulations that allowed citizens to kill wolves seen chasing, killing, or threatening to kill livestock.

Wolf hunting was recommended as a management tool in the final wolf conservation and management plan (FWP 2004) with the caveat that hunting could only be implemented when wolves were delisted and if there were more than 15 breeding pairs in Montana the previous year. Both of these conditions have been met. Wolves have been delisted since 2011 and there have been more than 15 breeding pair since 2002. The calendar year 2014 included parts of two hunting/trapping seaons for wolves. During the 2013-14 season portion of the 2014 calander year 94 wolves were harvested, and 119 were taken during the 2014-15 season portion for a total harvest of 213.

The total number of known wolf mortalities during 2014 was 308, with 301 of these mortalities being human-related, including 213 legal harvests, 57 control actions (50 agency control and 7 under defense of property statute or under shoot-on sight-permits), 11 vehicle strikes, 10 illegal killings, 6 killed under the newly-enacted Montana State Senate Bill 200, 2 capture-related mortalities, 1 euthanized due to poor health, and 1 legal tribal harvest. In addition, 1 wolf died of natural causes and 6 of unknown causes.

This annual report presents information on the status, distribution, and management of wolves in the State of Montana from January 1 to December 31, 2014. The report and other information about wolves and their management in Montana are available at http://fwp.mt.gov/fishAndWildlife/management/wolf/ .

INTRODUCTION AND BACKGROUND

Wolf recovery in Montana began in the early 1980's. Gray wolves increased in number and expanded their distribution in Montana because of natural emigration from Canada and a successful federal effort that reintroduced wolves into Yellowstone National Park (YNP) and the wilderness areas of central Idaho. Montana contains portions of all three federal recovery areas: the Northwest Montana Recovery Area (NWMT), the Central Idaho Experimental Area (CID), and the Greater Yellowstone Experimental Area (GYA) (Figure 1).

The biological and temporal requirements for wolf recovery in the northern Rocky Mountains of Montana, Idaho, and Wyoming were met in December 2002 and in 2003, all three states submitted wolf management plans to the USFWS for review. The USFWS accepted Montana's state plan and it is the document guiding wolf management in the state today.

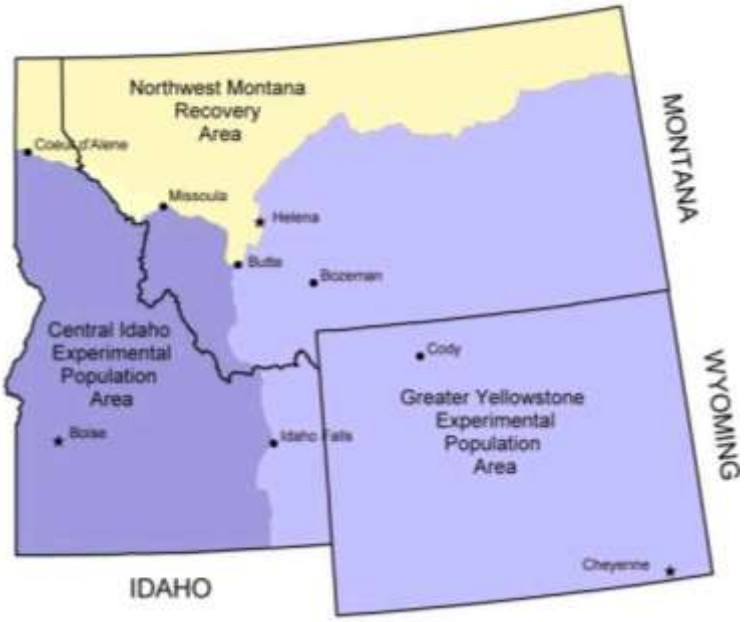

Figure 1. Northern Rockies gray wolf federal recovery area comprised of the states of Montana, Idaho, and Wyoming.

STATEWIDE PROGRAM OVERVIEW

The Montana Wolf Conservation and Management Plan is based on the work of a citizen's advisory council. Completed in 2003, the foundations of the plan are to recognize gray wolves as a native species and a part of Montana's wildlife heritage, to approach wolf management similar to other wildlife species such as mountain lions, to manage adaptively, and to address and resolve conflicts.

Prior to delisting in May 2011, the legal classification and federal regulations put wolves into two separate categories in Montana – endangered in northern Montana and experimental non-essential across southern Montana. Wolf-livestock conflicts were addressed and resolved using a combination of the statewide adaptive management triggers identified in the Montana plan and the federal regulations. In northwest Montana, the 1999 Interim Control Plan provided less flexibility to agencies and livestock owners. In contrast, more flexibility was provided through the revised 10(j) regulations (revised in February 2008).

Beginning with delisting in May 2011, the wolf was reclassified as a species in need of management statewide. Montana's laws, administrative rules, and state plan replaced the federal framework.

In the early stages of implementation, a core team of experienced individuals led wolf monitoring efforts and worked directly with private landowners. FWP's wolf team also worked closely with and increasingly involved other FWP personnel in program activities. Montana wolf conservation and management has transitioned to a more fully integrated program since delisting, led and implemented at the FWP Regional level. WS continues to investigate injured and dead livestock, and FWP works closely with them to resolve conflicts.

Overview of Wolf Ecology in Montana

Wolves are distributed primarily in western Montana east to the Beartooth face near Red Lodge inhabiting various habitats on both private and public lands (Figure 2). Montana wolf pack territory size estimates are naturally variable and heavily influenced by FWP's ability to collect location data on pack members throughout the year. Our confidence in estimating home territories for all packs has decreased as pack numbers, conflict management, and staff workloads increase.

The size of the average wolf pack with good documentation in Montana is between 6 and 7 wolves. The largest wolf pack documented in Montana in recent years has been 22 animals but packs this large are very rare. There is no significant difference in the average size of wolf packs across the state.

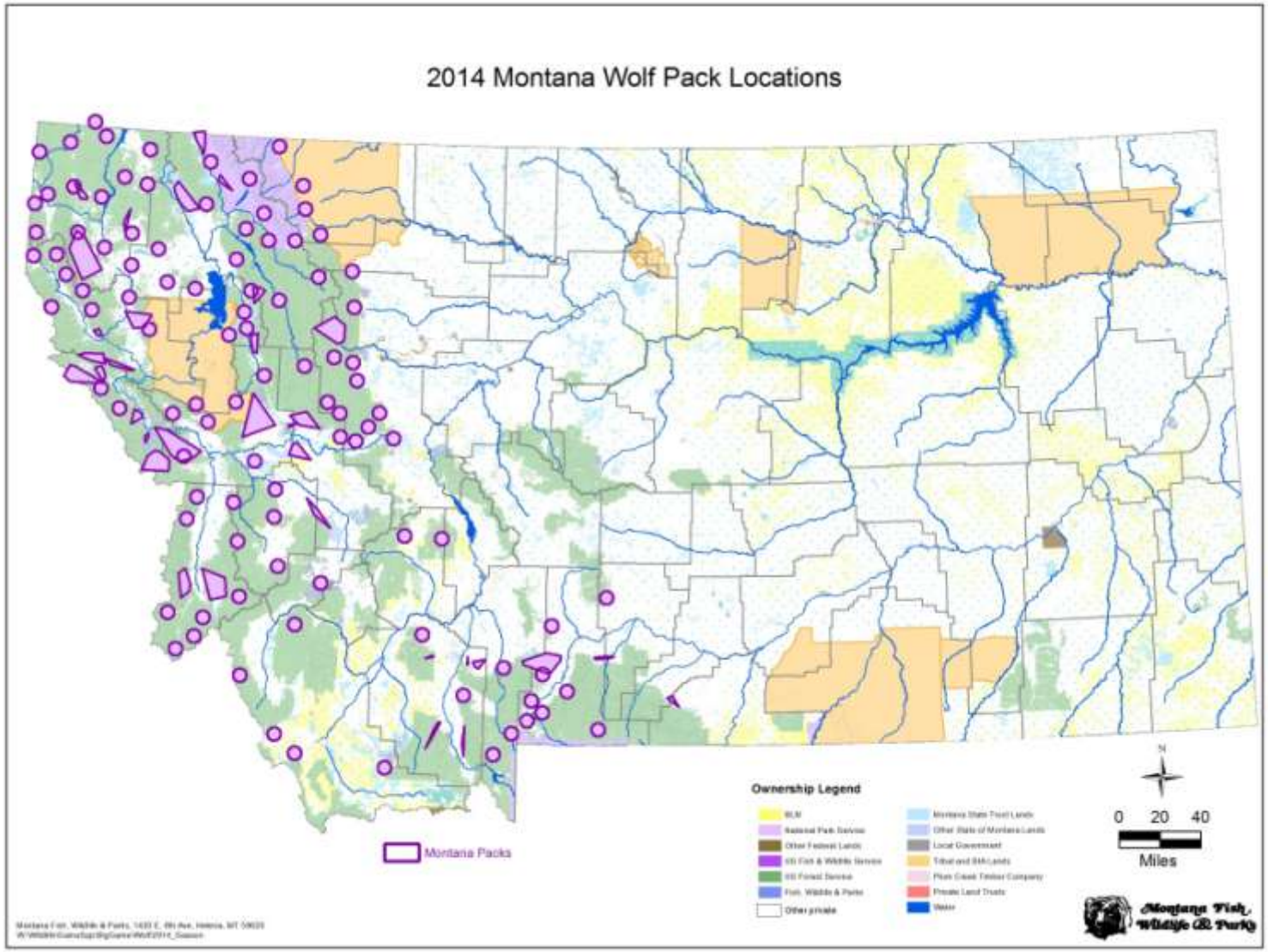

Figure 2. Verified wolf pack distribution in the State of Montana, as of December 31, 2014.

Monitoring Methods

Montana wolf packs are monitored year round. Common wolf monitoring techniques include direct observational counts, howling and track surveys, use of trail cameras, and public wolf reports. FWP seeks to document pack size and breeding pair status of known packs; determine pack territories and identify potentially affected private landowners; document dispersal to the extent possible and assess connectivity; and verify wolf activity in new areas that can result in new packs forming.

FWP conducts ground tracking and flies 1-2 times per month to locate collared animals and determine localized use throughout the year and the number of wolves traveling together. Den sites and rendezvous sites are visited to determine if reproduction has taken place. Additional information is collected, such as identification of private lands used by wolves, identification of public land grazing allotments where conflicts could occur, and common travel patterns. At the end of the year, FWP compiles information gathered through field surveys, telemetry, and public reporting.

FWP estimates the number of individual wolves in each pack when possible. Lone dispersing animals are accounted for when reliable information is available. Through its monitoring program, FWP is required to also tally and report the number of "breeding pairs" according to the federal recovery definition of "an adult male and a female wolf that have produced at least 2 pups that survived until December 31." Montana is required to maintain at least 10 breeding pairs as an absolute minimum to maintain the delisted status of wolves. The state plan calls for the maintenance of at least 15 breeding pairs. Packs of 2 or more wolves that meet the recovery definition are considered "breeding pairs" and noted as such in the summary tables. Not all packs in Montana satisfy the breeding pair criteria.

The total number of packs is determined by counting the number of animal groups with 2 or more individuals holding a territory that existed on the Montana landscape on December 31. If a pack was removed because of livestock conflicts or otherwise did not exist at the end of the calendar year (e.g. disease, natural/illegal mortality or dispersal), it is not included in the year-end total or displayed on the Montana wolf pack distribution map for that calendar year.

The statewide minimum wolf population is estimated by adding up the number of observed wolves in verified packs + known lone animals as of December 31 each year. This is a minimum count, not a population estimate, and has been reported as such since wolves first began re-colonizing northwestern Montana in the mid 1980's. Suspected wolf packs are those that could not be verified with confidence. They are not included in the final minimum estimated count.

FWP wolf monitoring data, while not a precise accounting of the number of wolves in Montana, are used to make decisions to address wolf-livestock conflicts, to set wolf hunting and trapping regulations, and to set harvest quotas. These minimum data are also adequate to demonstrate maintenance of a recovered population, such that relisting is not warranted.

In anticipation of an increased work load and declining federal funding, FWP first began considering alternative approaches to monitoring the wolf population in 2007. The capacity for

FWP personnel to monitor a growing wolf population is complicated by the robust wolf population growth since about 2006. The traditional field-based methods yield minimum counts that are increasingly conservative and inevitably below actual abundance. Preliminary work focused on developing a more reliable method to estimate the number of breeding pairs based on the size of a wolf pack using logistic regression models (Mitchell et al. 2008). Subsequent work focused on finding ways to use wolf observations by hunters in a more systematic way. A collaborative research effort with the University of Montana Wildlife Cooperative Research Unit was initiated in 2008. The primary objectives were to find alternative approaches to wolf monitoring that would yield statistically reliable estimates of the number of wolves, the number of wolf packs, and the number of breeding pairs (see ***Predicting abundance of gray wolves in Montana using hunter observations and field monitoring*** Appendix 3).

Border Packs

Northern Rocky Mountain wolf program cooperators have agreed that packs will be tallied in the population of the administrative area where the pack denned or spent most of their time. This assures that all packs are accounted for, but none are double-counted in population estimates. Transboundary packs are included in the administrative region in which the animals were counted.

During 2014, 21 packs occupied areas along the Montana-Idaho Border. Of those, 17 were counted as Montana packs. Six packs occupied the Montana-Yellowstone National Park boundary. Of those, 2 were counted as Montana packs. One pack variously occupied Montana, Yellowstone National Park, and Idaho. That pack (Madison) was counted as an Idaho pack. Five packs occupied the Montana-Canada border and 3 of those were counted as Montana packs.

Minimum Statewide Wolf Population and Distribution

As the wolf population has increased in size and distribution it has become increasingly difficult to obtain pack counts and to determine the breeding pair status of known packs. FWP increased the amount of field monitoring effort with the hiring of a new full time specialist in the Livingston area in late 2010. FWP also hired a new full time specialist to work in the Great Falls area beginning in 2012. FWP hired two experienced seasonal field technicians and brought on additional volunteers to help with monitoring efforts starting in 2012. Recent increases in the wolf population over the last few years have meant that FWP has to verify more new packs, the status of previously verified packs, and determine breeding pair status for as many packs as possible. Inevitably, some packs are suspected, but not verified and FWP conservatively notes those packs in the narrative. Those suspected packs are not included in the minimum estimate. Similarly, if the breeding pair status is not known with confidence, it is recorded as "not" a breeding pair or "breeding status unknown." Thus, the number of breeding pairs is a minimum known and others certainly exist, but could not be verified with existing effort. The Montana wolf population is secure and well above the 10 breeding pair minimum.

The Montana minimum wolf count decreased by 73 wolves, from a minimum count of 627 in 2013 to a minimum count of 554 in 2014 (Figure 3).

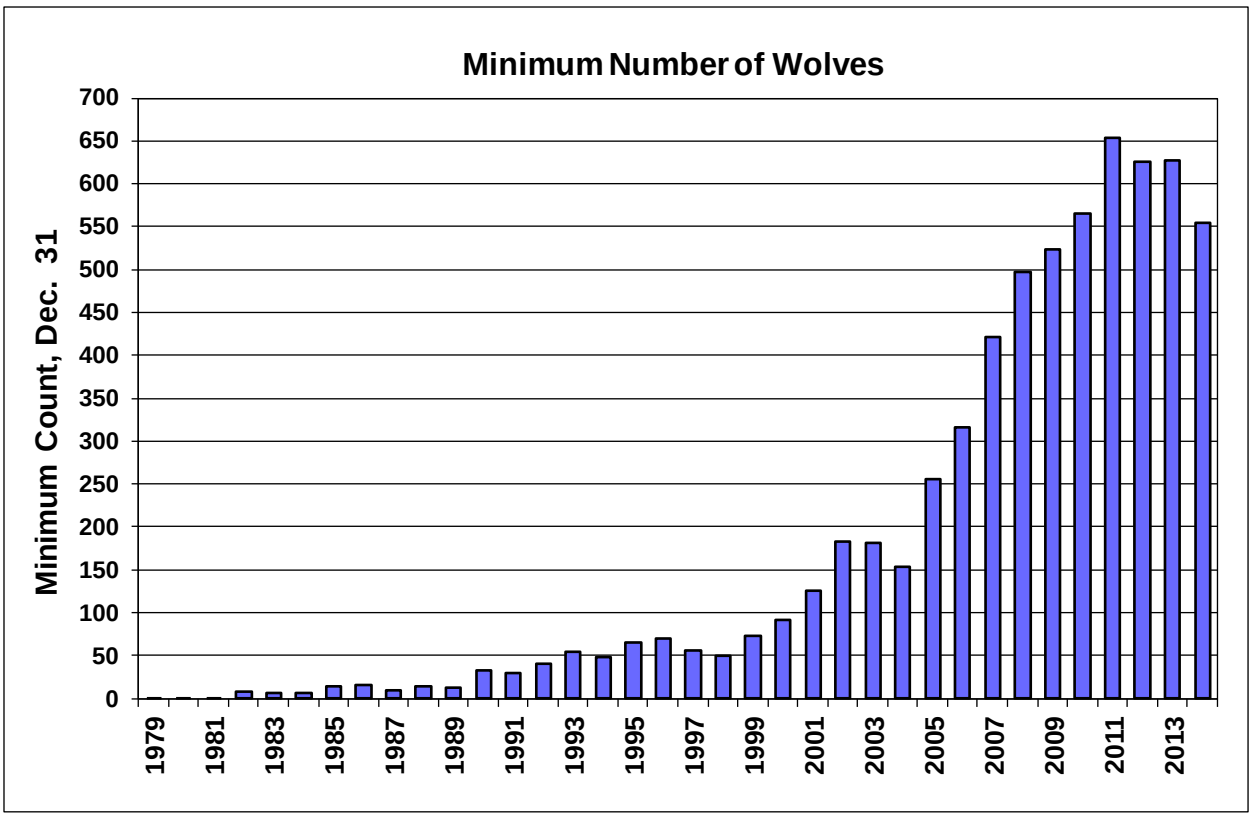

Figure 3. Estimated minimum number of wolves in Montana, 1979-2014

The minimum number of packs statewide decreased from 152 at the end of 2013 to 134 at the end of 2014 (Appendix 4). Pack numbers have steadily increased and become relatively stable since the minimum count of 46 in 2005. The minimum number of breeding pairs in Montana increased from 27 at the end of 2013 to 34 at the end of 2014 (Appendix 4). The number of verified breeding pairs generally increased, stabilized, and recently have decreased, in part due to increasing time commitments of verifying a growing number of wolves and packs.

In northwest Montana, the minimum wolf count decreased from 412 in 2013 to 338 in 2014. Seventeen of 91 packs were documented to have met the breeding pair criteria. Four wolf packs occurred on both the Blackfeet Indian Reservation and the Flathead Indian reservation, for a total of 8 packs on reservation lands.

In western Montana, the minimum wolf count decreased from 123 in 2013 to 94 in 2014. Six of 20 packs were documented to have met the breeding pair criteria. There continues to be high turnover in the population in parts of western Montana (e.g. Big Hole Valley) due to livestock conflicts and agency control. Yet, wolves recolonize some areas quite rapidly along the Montana-Idaho border.

In southwest Montana, the minimum wolf count increased from 92 in 2013 to 122 in 2014. Eleven of 23 packs were documented to have met the breeding pair criteria.

Regulated Public Hunting and Trapping

Regulated public harvest of wolves, recommended by the Governor's Wolf Advisory Council in 2000, was included in Montana's final wolf conservation and management plan. In 2001, the Montana Legislature authorized the FWP Commission to reclassify wolves under state law from an endangered species to a species in need of management upon federal delisting. In anticipation of delisting, FWP first began exploring the idea of how to design regulated public hunting and trapping for wolves early in 2007. The 2007 Legislature created a wolf hunting license for residents and nonresidents (SB 372). The 2013 Legislature modified that statute to allow the sale of multiple wolf licenses, allowing the FWP Commission to set hunting bag limits higher than 1 wolf per hunter (HB 73). Other statutes within MCA enable the FWP Commission to adopt rules and regulations pertaining to wolf hunting and trapping as a species in need of management upon delisting. FWP developed and implemented wolf harvest strategies that maintain a recovered and connected wolf population, minimize wolf-livestock conflicts, reduce wolf impacts on low or declining ungulate populations and ungulate hunting opportunities, and effectively communicate to all parties the relevance and credibility of the harvest while acknowledging the diversity of values among those parties. The Montana public has the opportunity for continuous and iterative input into specific decisions about wolf harvest throughout the public season-setting process. Finally, hunting can only be implemented when wolves are successfully delisted and if more than 15 breeding pairs of wolves existed in Montana the previous year.

Following the delisting of wolves in Montana in May 2011, a statewide wolf quota of 220, partitioned into fourteen individual wolf management units (WMU's) was proposed at the May FWP Commission meeting. FWP proposed quotas or subquotas in WMU 150 and in deer/elk hunting districts (HD's) 280 and 313/316 where an early back country rifle wolf season would coincide with the existing early elk back country hunting season. An archery-only wolf season in all WMUs with an allocated harvest potential not to exceed 20% of the WMU quota or subquota was also proposed to coincide with the existing deer and elk archery only season. Any harvest over-run at the WMU scale was proposed to be reduced from adjacent WMU quotas, other WMUs in the region or at the statewide scale to eliminate potential for any harvest over-run. Additional mechanisms to regulate take included rigorous tracking of harvest in each WMU through mandatory harvest reporting and a 24-hour closure notice process. Harvest quotas were proposed to tally only legal hunting harvest. In addition to other forms of wolf mortality (including cattle depredation removal), a harvest equal to the proposed quota level was predicted to reduce the year-end minimum total wolf numbers 25% from 566 in 2010 to approximately 425 in 2011. By December 31, 121 wolves had been harvested during the legal take season and quotas had been met in only 2 of the 14 WMUs. At the November FWP Commission meeting a season extension was proposed in order to increase wolf harvest closer to the statewide quota of 220. That specific proposal extended the 2011 wolf hunting season through January 31, 2012 or until specific WMU quotas were met. The commission adjusted the season extension end date to February 15, 2012 at the December commission meeting and then adopted that extension. From January 1 through February 15, 2012, 45 wolves were harvested by hunters.

On July 12, 2012, the FWP Commission adopted the framework for the 2012-13 wolf season. Significant changes included a hunting closing date of February 28; no statewide quota with WMU quotas remaining only in WMU's 110 (2) and 316 (3); trapping authorized from December 15

through February 28; overall bag limit of 3, with up to 3 taken via trapping and up to 1 taken via hunting; and up to 3 taken via hunting with the passages of necessary legislation. On February 19, 2013, Governor Bullock signed House Bill 73 which, among other elements, authorized electronic calls and the sale of multiple wolf hunting licenses. Given the prior commission authorization on July 12, the hunting bag limit was increased to 3 and electronic calls were allowed immediately. At the close of the season on February 28th, the harvest included 128 wolves taken by hunters and 97 wolves taken by trappers, for a total of 225 wolves harvested during the 2012-13 season. The total, calendar year 2012 wolf harvest in Montana was 175, including 45 wolves harvested during the 2011-12 season and 130 wolves harvested during the 2012-13 season.

On July 10, 2013, the Fish and Wildlife (FW) Commission adopted the framework for the 2013-14 wolf season. Significant changes included a longer general season extending from September 15, 2013 through March 15, 2014; bag limit of 5 wolves per person; and creation of WMU 313 with a quota of 4 wolves. These changes were carried into the 2014-2015 wolf season. At the close of the 2013-14 season on March 15, 2014, the harvest included 144 wolves taken by hunters and 86 wolves taken by trappers, for a total of 230 wolves harvested during the 2013-14 season. The total, calendar-year 2013 wolf harvest in Montana was 231, including 95 wolves harvested during the 2012-13 season and 136 wolves harvested during the 2013-14 season. At the close of the 2014-15 wolf season on March 15, 2015, the harvest included 144 wolves taken by hunters and 86 wolves taken by trappers, for a total of 207 wolves harvested during the 2014-15 season. The total, calendar-year 2014 wolf harvest in Montana was 213, including 94 wolves harvested during the 2013-14 season and 119 wolves harvested during the 2014-15 season.

Fish, Wildlife & Parks Wildlife Lab Surveillance of Wolf Mortality and Disease, 2007-2014

Biologists continued to collect genetic samples (gene cards, hair, tissue samples) and blood from live wolves captured in the field during 2014. Genetic samples are being banked at the wildlife lab in Bozeman. Blood was used to conduct serological testing for exposure to *Brucella abortus*, *Brucella canis*, Canine Parvovirus (CPV), Canine Adenovirus (CAV), Canine Distemper Virus (CDV), Canine Herpes Virus (CHV), *Neospora caninum*, and Leptospirosis.

To date, no wolves tested had titers suggesting serologic evidence for exposure to *Brucella abortus* or *Brucella canis*. Likewise, no wolves had an antibody titer for any serovars of Leptospirosis which were included in serology panel. However, wolves have been found with an antibody titer for *Neospora caninum*. Relatively high proportions of wolves (70% - 89%) tested in 2013 had titers for CPV, CHV, CAV, and CDV. Most of the titers for these viruses were quite low. However, some animals had relatively high titers for CAV and CPV, which may indicate recent exposure to the virus or active infection. It is not uncommon to find high proportions of animals with antibody titers to such viruses in areas in which the viruses are enzootic in the wild population. Almberg et al. (2009) found evidence of constant high exposure to CPV, CAV, and CHV in canids in Yellowstone National Park.

A small number of wolf carcasses were brought to the wildlife health lab in Bozeman for evaluation in 2014. Most of these carcasses were examined upon request of Montana FWP biologists or game wardens as part of an enforcement case or to attempt to determine cause of death.

A more thorough discussion of wolf diseases and previous serology and parasitology sampling results can be found in the 2010 annual report.

2014 Documented Statewide Wolf Mortalities

FWP detected a total of 308 mortalities in 2014 statewide due to all causes (Figure 4). Undoubtedly, additional mortalities occurred but were not detected. Because mortality counts and total population counts are incomplete, actual mortality rates cannot be determined.

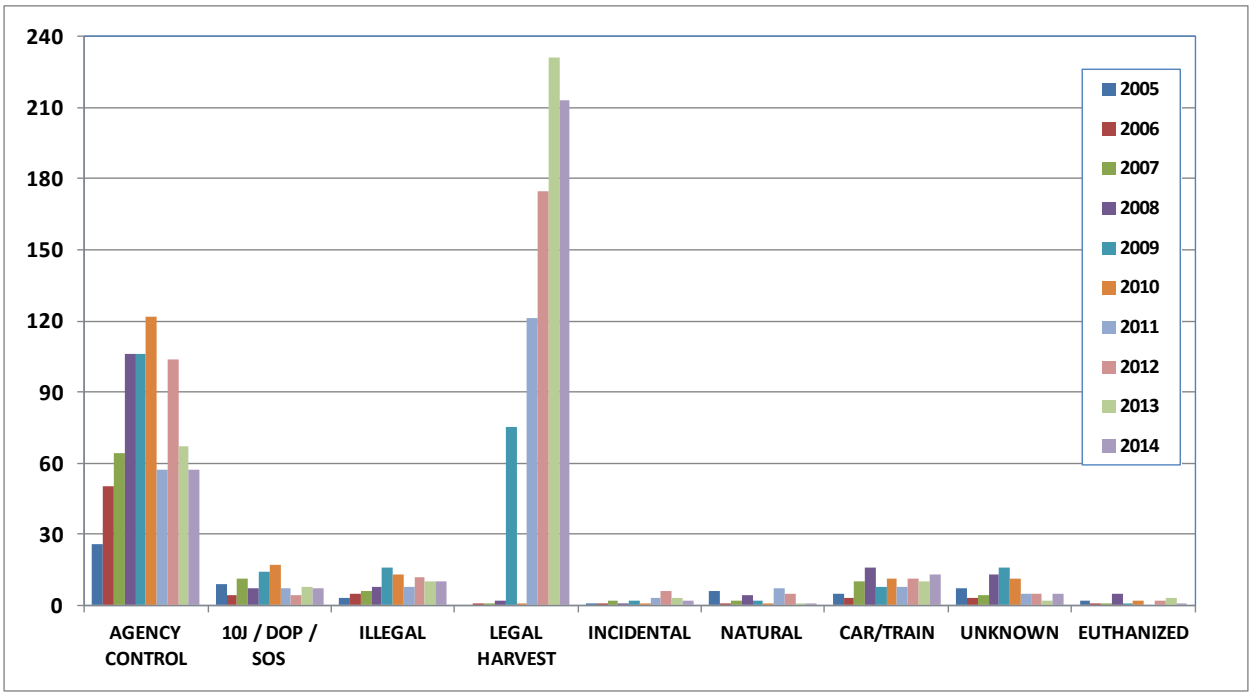

Figure 4. Minimum number of wolf mortalities documented by cause for gray wolves (2005-2014). Total number of documented wolf mortalities in 2014 was 308.

The majority of wolf mortality overall in Montana is related to humans: livestock conflict removals, regulated public harvest, car strikes, train strikes, illegal killings, and incidental to other activities (e.g. trapping/snaring). That pattern is similar across time and all of the northern Rocky Mountains, except inside national parks where the majority of wolf mortality is due to intraspecific strife (wolf on wolf aggression) or other natural causes.

Documented total wolf mortality in 2014 (308) was lower than in 2013 (335). Mortalities in 2014 included 213 public harvests versus 231 harvests in 2013. There were fewer lethal control removals in 2014 (57) than in 2013 (75). Of the 57 wolves removed in 2014 for livestock depredations, 7 were killed by private citizens under the Montana state law known as the Defense of Property statute. Other mortalities included: 11 vehicle collisions, 10 illegally killed, 6 killed under SB200, 2 incidental mortalities, 1 euthanized, and 1 legal tribal take. In addition, 1 wolf died of natural causes and 6 of unknown causes. Among illegally killed wolves 8 were

shot, one had been caught in a coyote snare, and one could not be determined although the collar was in the water under a bridge and could not be recovered.

Similar to other species that Montana manages, illegal mortalities among wolves are often difficult to document because many result from clandestine criminal activities. While other mortalities such as those from hunting and trapping, Wildlife Services' management removals, defense of property, SB 200 and other legal causes are nearly full counts, mortality from other causes, including illeagal mortalities, are a minimum count. Moreover, with the legal harvest of 200-plus wolves in Montana, there will inherently be more 'mistakes' by hunters and trappers that get classified as illegal harvests. This is also true of any managed species that we hunt be it black bear, mountain lion, deer, elk, ducks or grouse.

MFWP has started to try to track trend in illegal mortality using collared and non-collared samples relative to the estimated population (number of packs times mean pack size). It appears to FWP staff that illegal activity has gone down since the need to resort to this activity is diminished with a legal season of 5 wolf bag limit, the institution of trapping, and a longer season over the past few years. In the final analysis, wolves in Montana are thriving and productive, like many big game species in the state, and illegal take does not appear to be a major source of mortality.

Mange continues to be documented in southwest Montana. It does not appear to have a detrimental effect on Montana's wolf population as a whole (see Jimenez et al. 2010).

Wolf – Livestock Interactions in Montana

Montana wolves routinely encounter livestock on both public grazing allotments and private land. Wolves are opportunistic predators, most often seeking wild prey. However, some wolves "learn" to prey on livestock and teach this behavior to other wolves. Wolf depredations are very difficult to predict in space and time. The majority of cattle and sheep wolf depredation incidents confirmed by WS occurred on private lands. The likelihood of detecting injured or dead livestock is probably higher on private lands where there is greater human presence than on remote public land grazing allotments. The magnitude of under-detection of loss on public allotments is unknown. Nonetheless, most cattle depredations occurred in the spring or fall months while sheep depredations occurred more sporadically throughout the year.

USDA Wildlife Service's workload increased through 2009 as the wolf population increased and distribution expanded. The number of suspected wolf complaints received by WS increased steadily from federal fiscal year 1997 to 2009 (Figure 5). The number of complaints received since those years declined from 233 complaints in 2009 to 92 in 2014. About 50% of the complaints received by WS are verified as wolf-caused.

In 2012 wolves were under full management authority of the state and wolf-livestock conflict resolution was guided by a combination of Montana's approved state plan and the administrative rules of Montana. Federal and state regulations since 2009 have allowed private citizens to kill wolves seen in the act of attacking, killing, or threatening to kill livestock. In 2009, 14 wolves

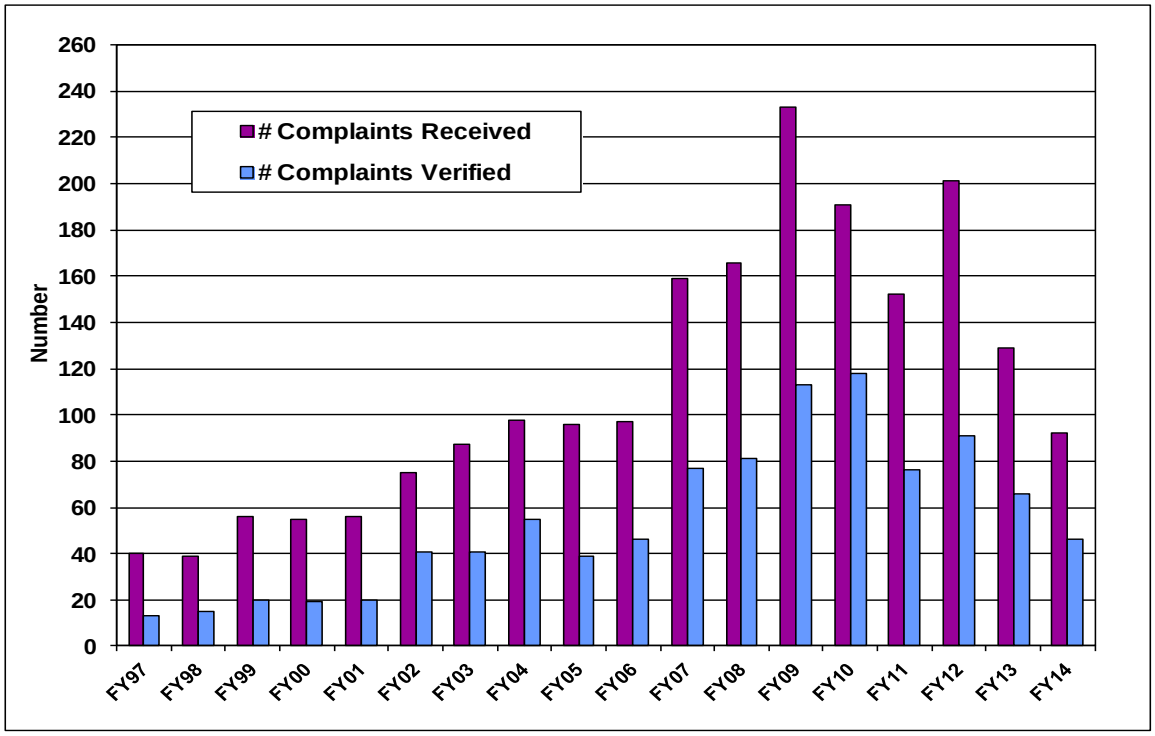

Figure 5. Number of complaints received by USDA Wildlife Services as suspected wolf damage and the number of complaints verified as wolf damage, FFY 1997 – 2014.

were taken by private citizens, 17 were taken in 2010, 7 in 2011, 5 in 2012, 8 in 2013, and 7 in 2014. The remainder of wolves killed in control situations were removed by federal agency personnel.

Depredation Incidents in 2014

WS confirmed that, statewide, 37 cattle, 8 sheep, 1 dog, and 1 miniature pony were killed by wolves in 2014, compared to 50 cattle, 24 sheep, 1 goat, and 3 horses (3 Shetland ponies) killed by wolves in 2013. Total confirmed cattle and sheep losses were down from 2013 levels and are the lowest recorded in the last seven years (Figure 6). The number of wolves removed in control actions (57) also was lower in 2014 than in any year since 2006. The overall decrease in livestock depredations since 2009 may be a result of several factors including a trend toward more aggressive wolf control in response to depredations and effects of legal wolf harvest. In 2014, WS confirmed 8 cattle and 1 ram as injured by wolves, and reported another 14 cattle and 2 ewes as probable wolf depredations. Furthermore, many livestock producers reported "missing" livestock and suspected wolf predation. Others reported indirect losses including poor weight gain and reduced productivity. There is no doubt that there are undocumented losses. To address livestock conflicts and to reduce the potential for further depredations, 57 wolves were killed in 2014, compared to 75 wolves killed in 2013. Seven of the 57 were killed by private citizens when wolves were seen chasing, killing, or threatening to kill livestock. The others were taken by WS using either ground or aerial based methods. Nineteen packs that

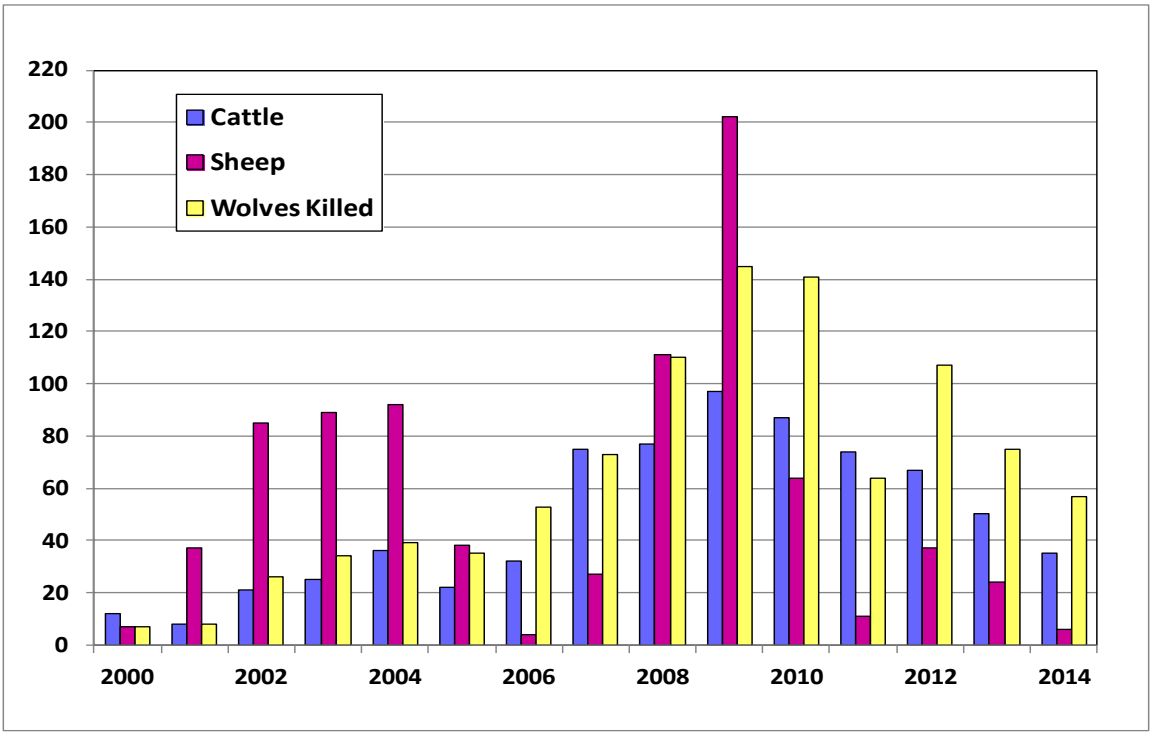

Figure 6. Number of cattle and sheep killed by wolves and number of wolves removed through agency control and take by private citizens, 2000-2014.

existed at some point during 2014 were confirmed to have killed livestock. Two of these packs were removed entirely due to chronic livestock conflicts in 2014.

Montana Livestock Loss Board: A Montana-Based Reimbursement Program

The Montana Wolf Conservation and Management Plan called for creation of this Montana-based program to address the economic impacts of verified wolf caused livestock losses. The plan identified the need for an entity independent from FWP to administer the program.

The purposes of the MLLB are to provide financial reimbursements to producers for losses caused by wolves based on the program criteria and to proactively apply prevention tools and incentives to decrease the risk of wolf-caused losses and to minimize the number of livestock killed by wolves through proactive livestock management strategies.

The Loss Mitigation element implements a reimbursement payment system for confirmed and probable losses that are verified by USDA WS. Indirect losses and costs are not directly covered, but eventually could be addressed through application of a multiplier for confirmed losses and a system of bonus or incentive payments. Eligible livestock losses are cattle, calves, hogs, pigs, horses, mules, sheep, lambs, goats, llamas, and guarding animals. Confirmed and probable death losses are reimbursed at 100% of fair market value. Veterinary bills for injured livestock that are confirmed due to wolves may be covered up to 100% of fair market value of the animal when funding becomes available.

Preliminary reimbursement totals for 2014 are $72,268 paid to livestock owners on 47 head of livestock. Overall, 2014 livestock losses decreased over 2013 totals. Both cattle and sheep losses decreased in 2014. Individual animal values continue to be higher than animal values in prior years.

Livestock loss statistics are available for 2008 to the present on the board's website http://liv.mt.gov/LLB/lossdata_2014.mcpx. The board began accepting claims in the spring of 2008. Total numbers for 2009 to 2014 are for a full calendar year.

The Livestock Loss Board has a Facebook page where the number of livestock killed and the county where the loss occurred is listed. This page is updated on the same day the livestock loss claim is received. To view the page, go to https://www.facebook.com/pages/Livestock-Loss-Board/208087235878971.

See the MLLB for detailed information http://liv.mt.gov/LLB/default.mcpx .

AREA SUMMARIES

Northwest Montana
Montana Portion of the Northwest Montana Recovery Area (NWMT)

Overview

In 2014, we verified a minimum count of 338 wolves in 91 packs and 17 breeding pairs in the Montana portion of the Northwest Montana (NWMT) recovery area, compared to 412 wolves in 104 packs and 15 breeding pairs in 2013. There were four newly identified packs in 2014: Brimstone, Crown Mountain, Flesher Pass, and Lost Soul. Some of these packs are believed to be first-year packs, and some are likely to have existed the previous year. One of the new packs, Brimstone, was thought to be gone by the end of 2014, due largely to vehicle collisions and an illegal mortality. One pack, Ophir Creek, was removed from the population as a consequence of chronic livestock depredation. Another 15 packs could no longer be counted due to lack of evidence: Cottonwood, Dalton Mountain, Deer Creek, Dirtyface, Dry Forks, Ferry Basin, Good, Halfmoon, Keystone, Lamoose, Leota, McGinnis, Mullan, Nasu'kin, and Ovando Mountain. These factors combined produced a net decrease of 13 packs in NWMT in 2014.

Fifty-seven radio-collared wolves in 39 packs, 43% of the 91 total known packs, were monitored in NWMT during at least some portion of 2014. This is the same number of packs monitored in 2013. MFWP captured and radio-collared 26 wolves in 21 packs in 2014. Wildlife Services captured and collared an additional seven wolves in seven packs. Radio-collared wolves were located from aircraft approximately 1–2 times per month. Thirty-four radio-collared wolves from 27 packs (30% of the 91 total packs) were still being monitored by the end of the year. Twenty collars were lost throughout the year due to a variety of factors: six harvested, six unknown mortalities, five illegal mortalities, one vehicle collision, one slipped collar, and one dead battery. In addition, three collared wolves from the Ashley, Kerr, and Ninemile packs,

were missing by the end of the year. Missing collars are due to long-range dispersal, collar failure, or other unknown fate. No dispersals were recorded in 2014.

The 91 packs included in the Montana portion of the NWMT recovery area as of December 2014 are listed in Table 1a. There are 11 packs within the Montana/Idaho transboundary area. Nine of these packs, Cache Creek, DeBorgia, Lost, Lost Peak, Preacher, Silver Lake, Solomon Mountain, Twilight, and Wiggletail, den and spend most of their time in Montana and therefore are counted toward the Montana population. Two of these packs, Copper Falls and Cedar, den and spend most of their time in Idaho and therefore are counted toward the Idaho wolf population. MFWP monitors these packs in close coordination with IDFG and the NPT. Five packs reside within the US/Canada transboundary. Three of these international packs, Kintla, Kootenai North, and Kootenai South, den and spend most of their time in Montana and therefore are counted toward the Montana population. Two packs, Spruce Creek and Belly River, den and spend most of their time in Canada and therefore are not counted in the NWMT population.

We were able to confirm reproduction in 36 wolf packs in Northwest Montana, with 17 of those packs qualifying as breeding pairs at the end of 2014 (Table 1a). Breeding pair status could not be documented in some packs because we were unable to confirm a minimum of two adults and two pups at the end of the year. Reproduction was confirmed in the Arrastra Creek, Baptiste, Belmont, Bennie, Blowout Mountain, Brimstone, Cache Creek, Chamberlain, Condon, Crown Mountain, Dog Gun, Flesher Pass, Garden, Inez, Kerr, Kootenai North, Ksanka, Lost Peak, Lost Soul, Mineral Mountain, Murphy Lake, Noisy, Olson Peak, Petty Creek, Preacher, Redshale, Satire, Savenac, Silver Lake, Sunrise Mountain, Telephone Butte, Teton, Tom Meier, and Weigel packs. Reproductive status of other Northwest Montana wolf packs was unknown, except the Livermore and Morrell Mountain packs were believed to have produced no pups.

Two hundred wolf mortalities were documented in the Montana portion of the Northwest Montana recovery area population in 2014. Six wolves were found that died of unknown causes. All other documented mortalities were attributed to some form of human cause including 140 wolves legally harvested (down slightly from 147 in 2013), 32 lethally removed in control actions (29 by Wildlife Services and 3 by citizens protecting livestock; down from 47 in 2013), 8 illegally killed (same as 2013), 10 vehicle collisions (up from 5 in 2013), 3 wolves legally killed under the newly enacted Montana State Senate Bill 200 rules, and 1 wolf euthanized due to poor health. One illegally killed wolf, a radio-collared male dispersing from the Diamond pack in Eastern Washington State, was found in November in Mineral County, Montana. All control action and legally harvested mortalities are precise numbers, while the number of mortalities from all other causes is a minimum observed. Because mortality counts and total population counts are incomplete, actual mortality rates cannot be determined. The hunting season continued beyond 2014 for another 2.5 months.

In NWMT nine wolf packs, ~10% of the 93 packs that existed during some part of 2014, were confirmed to have killed livestock (Table 1a): Arrastra Creek, Blowout Mountain, Dry Forks, Flesher Pass, Garden, Livermore, Looking Glass, Ophir Creek, and Satire. We documented 17 confirmed kills of livestock or domestic animals: 15 cattle, one dog, and one miniature pony. For Northwest Montana, total confirmed kills in 2014 were less than half of the 35 documented kills in 2013. An additional four calves and two cows were classified as probable wolf kills, and

five calves and 1 cow were confirmed as injured by wolves in 2014. The number of wolves lethally controlled in Northwest Montana decreased from 47 in 2013 to 32 in 2014. Three of those were legally killed by livestock producers that caught wolves in the act of killing livestock. No wolves were legally killed by affected livestock producers issued kill permits. One pack, Ophir Creek, no longer exists due primarily to control actions. These figures only account for verified losses. It is not possible to document unverified losses due to wolves. Unverified losses are losses where the cause of dead or missing livestock is not known.

Nonlethal measures including livestock carcass pickup, range riders, and aversive tools such as Radio Activated Guard (RAG) boxes and fladry are routinely deployed where applicable and as available. In Northwest Montana, FWP was involved in a collaborative proactive risk management project in the Blackfoot Valley. The Blackfoot Challenge Range Rider Project employed seasonal range riders to monitor livestock and predators in areas occupied by the Arrastra Creek, Morrell Mountain, and Ovando Mountain wolf packs. Fladry was also used in the Blackfoot Valley, Ninemile, and St Regis areas.

Miscellaneous / Lone Individuals in Northwest Montana

Savenac NW2071F: This adult female wolf was traveling alone at the end of the year.

Stark Mtn: Four wolves were using the Stark Mountain area at the end of the year.

Sweetgrass Hills: One wolf was confirmed present in the East Butte area of the Sweetgrass Hills.

Elk Park (North of Butte): One calf was confirmed killed by a wolf or wolves and another calf reported as a probable wolf kill in two separate incidents in 2014.

NW3048: A yearling collared wolf was traveling alone in the area North of Butte at year end.

Lookout Pass: An adult male wolf from an unknown pack was struck by a vehicle on I-90 on the Montana side of Lookout Pass, and an adult male from an unknown pack was killed illegally and found near the Randolph Creek exit off I-90.

Plains: An adult male wolf from an unknown pack was killed on Highway 200 west of Plains.

Thompson Lakes: A wolf pup from an unknown pack was killed by a vehicle along Highway 2 west of Thompson Lakes.

Diamond pack (WA) Disperser: A radio-collared male wolf from the Diamond pack on the Washington-Idaho border was killed illegally in Mineral County, Montana, in November, 2014.

Verified Border Packs Counting in Idaho Population Estimate

Copper Falls and Cedar packs are believed to den and spend most of their time in Idaho.

Verified Border Packs Counting in Canada Population Estimate

Spruce Creek and Belly River packs are believed to den and spend most of their time in Canada.

Suspected Packs in Northwest Montana

Stark Mountain: see above.

Sweetgrass Hills: FWP received reports of one to three wolves in the Sweetgrass Hills in the fall of 2014 and will be monitoring the area for evidence of consistent use by wolves in 2015.

Western Montana
Montana portion of the Central Idaho Experimental Area

Overview

At the end 2014, we documented a minimum estimate of 94 wolves and 20 packs in the Montana portion of the Central Idaho Experimental Area. This is a decrease from the 2013 estimate of 123 wolves and 26 packs. There was one newly identified pack in 2014.

Previously verified packs that still existed in 2014 were the Alta, Ambrose, Anaconda, Black Pine, Bloody Dick, Divide Creek, East Fork Rock Creek, Flint, Gash Creek, Gird Point, Jeff Davis, One Horse, Overwhich, Pyramid, Sliderock Mountain, Sula, Tepee Point, Trapper Peak, and Watchtower packs. Newly documented pack in 2014 included Foolhen. No packs were removed in 2014 due to livestock depredations. The Burnt Fork and Ross' Fork packs were removed by harvest. Mt Haggin could not be verified and may have formed a new pack or may have been lethally removed because of livestock conflict.

During 2014, 8 of 20 (40%) Montana CID verified packs were monitored using ground and aerial telemetry at some point during the year. At the end of 2014, 5 (25%) of 20 Montana CID verified packs were being monitored using ground and aerial telemetry. Three wolves in two packs were captured and radio collared in the Montana portion of the CID in 2014. No wolves were radio collared during MFWP trapping efforts and three were radio collared by WS. Radio collared wolves were located 1- 2 times per month by fixed-wing aircraft when possible. During 2014, 8 of 20 packs monitored in the MT portion of the CID occupied the Montana/ Idaho border: Alta, Bloody Dick, Gash Creek, Jeff Davis, Overwhich, Pyramid, Sula, and Watchtower. In 2014, four packs were verified to spend time in Idaho. The others may spend time in Idaho, based on proximity of sightings or telemetry locations near the Montana/Idaho border. Because these packs denned in Montana, or were known to have spent most of their time in Montana, they were counted as Montana packs for 2014. MFWP conducts most of the monitoring of these packs in close coordination with IDFG and the NPT.

The Big Hole and Four Eyes (Idaho/Montana border packs) denned and spent time in Idaho in 2014 and will therefore count in the Idaho population estimate.

Reproduction was confirmed in eight packs: Anaconda, Bloody Dick, Divide Creek, Flint, Jeff Davis, One Horse, Pyramid, and Tepee Point packs. At the end of 2014 six packs met the breeding pair requirement: Anaconda, Bloody Dick, Divide Creek, Flint, Jeff Davis, and Pyramid. Reproductive status of the Alta, Ambrose, Black Pine, East Fork Rock Creek, Gash Creek, Gird Point, Overwhich, Sliderock Mountain, Sula, Trapper Peak, Watchtower, and Foolhen packs was unknown. No dispersal was documented in the CID in 2014.

Four packs were confirmed to have killed livestock: Bloody Dick, Flint, One Horse, and Trapper Peak. Single or unknown wolves were responsible for killing seven calves and four sheep. This is down from five (2013) packs and up from 3 total livestock killed by lone or unknown wolves in 2013. In total, 13 cattle and four sheep were confirmed killed in 2014. This is down from 16 cattle and up from one sheep in 2013. Two calves and one ram were confirmed injured, and two calves, one cow, and one ewe were reported as probable wolf kills. Forty-seven wolf mortalities were documented in 2014, down from fifty-nine in 2013. Fifteen wolves were killed in response to depredations: 13 were killed by WS in management actions, one by WS incidentally by a trapping mortality, and two were killed by a landowner legally defending property. One wolf was killed illegally. Thirty wolves were harvested legally during 2014, down from 34 in 2013.

In the CID two collaborative proactive risk management projects were accounted for this year that FWP was involved in. This was the fourth year of a range rider project in the upper Big Hole near Jackson. The rider project will continue into 2015 as well. In addition a collaborative project with utilizing Livestock Guarding Dogs to protect cattle was in its third year in the upper Big Hole near Wisdom and will continue into 2015. An additional Livestock Guard Dog project began with cattle. Planning and development process began in developing a carcass pickup program and the program should be in place by 2015.

Verified Border Packs Counting in Idaho Population Estimate (Table 3 in Appendix 3)

Big Hole: See 2014 Idaho Annual Report. This packs lives around the Lolo Pass area west of Missoula.

Four Eyes: See 2014 Idaho Annual Report. Historically this pack has spent time in Montana and was detected in 2014 in Montana in the Big Sheep Creek area.

Miscellaneous / Lone Individuals in Montana CID

Upper Big Hole: One lone wolf was killed in response to a depredation.

South Pintlers: Four wolves were killed in separate incidents. It is unknown if this was a new pack or an existing pack that shifted into a new area.

Bertie Lord: There was a pair of wolves in the Bertie Lord area (East Fork Bitterroot) at the end of the year.

Coal Creek: There was a pair of wolves in the Coal Creek area (West Fork Bitterroot) at the end of the year.

Suspected Packs in Montana CID

East Pioneers area: FWP received reports of wolves in several areas of the East Pioneers. Further work is needed to determine whether a new pack is establishing in the area or if dispersers were passing through.

West Pioneers area: FWP received some reports of wolves in the West Pioneers. Further work is needed to determine whether a new pack is establishing in the area or if dispersers were passing through.

South Pintlers: FWP received reports of wolves in the South Pintlers and WS confirmed livestock depredations and lethally removed wolves. Further work is needed to determine whether a new pack or individual remain in the area.

Other Miscellaneous Information in Montana CID

Upper Big Hole: One calf was killed by unknown wolves. This was most likely associated with a lone wolf.

Dell Area: One bull and 4 sheep were killed by the Four Eyes pack that is counted in Idaho.

South Pintlers: Two yearlings and 1 calf were killed in separate incidents in the area and it is unknown if it was new wolf activity or neighboring pack activity.

Grasshopper: One calf was killed by unknown wolf or wolves.

Grasshopper/Horse Prairie: One cow was killed by wolves but it was unknown which pack was involved.

OR18: A dispersing adult male from Oregon, OR18, was illegally killed in the Bitterroot Valley in May 2014.

Southwestern Montana
Montana Portion of the Greater Yellowstone Experimental Area (GYA)

Overview

Packs in the Montana portion of the GYA were documented from the Redlodge area, north to the Crazies and West to Dillon, south to the Idaho and WY borders. Agencies (YNP, MFWP), primarily monitor these packs through flights and ground tracking. The location of the den site and the percent area / time in an area determines where that pack will be tallied in each state's population estimates.

In 2014, we documented a minimum estimate of 122 wolves in 23 verified packs, 11 of which qualified as a breeding pair within the GYA. This represents a 33% increase in the minimum count compared with 2013 (92 wolves). This year's number of breeding pairs (11) increased from five breeding pairs last year and the number of packs (23) was one greater than the 22 packs reported in the GYA in 2013. Five new packs were documented in 2014, including: Shinglemill, Buffalo Fork, Lebo Peak, Slip n' Slide Creek and Carmichael. There were 16 packs that were verified in 2013 and still existed in 2014: Baker Mountain, Beartrap, Brackett Creek, Cedar Creek, Cougar 2, Elkhorn, Fridley, Hayden, Hogback, Jack Creek, Meadow Creek, Romy Lake, Steamboat Peak, Tanner Pass, Toadflax, and Wilson Creek packs. Efforts to document the Avalanche, Davey Butte, Elephant Rock, Horsethief Mountain, West Fork and Jack Creek packs indicated there was not enough evidence to confirm the packs were still intact and maintaining territories at the end of the calendar year. The Price Creek pack, now counted toward the GYA population in 2014, has shifted its territory, and formerly was counted toward the CID population in 2013.

One border pack was shared between Montana, Idaho and Yellowstone National Park (the Madison pack). Two other pack territories spanned across the border with YNP (Cougar 2 and Hayden) and were counted toward the MT population in 2014. Four border packs (Eightmile, Blacktail, Junction Butte, and Cougar) were documented to have spent some time in MT, but were counted toward the WY (YNP) population.

The number of collared wolves and the number of wolf packs with at least one member fitted with a radio collar varies throughout the year as new wolves are collared. Additionally, the total number changes as collared wolves die, radio collars malfunction, or collared wolves disperse and are not relocated. At the end of 2014, 7 of 23 (30%) verified packs were being monitored using ground and aerial telemetry. Radio-collared wolves were located at least one to two times per month by fixed-wing aircraft and ground telemetry.

In the GYA in 2014, 6 of 23 packs (26%) that existed at one time during the year were confirmed to have killed livestock (Table 1b). This resulted in agency lethal removal of a total of 8 wolves, with 2 wolves removed by citizens using the defense of property law. A total of nine cattle and four sheep were confirmed as wolf kills in the GYA in 2014. Additionally, two calves, three yearling cows and one ewe were determined to be probable wolf kills. The West Fork pack was eliminated due to chronic livestock conflicts, whereas zero, two, one, and four packs were eliminated during 2013, 2012, 2011, and 2010, respectively.

Sixty-one total wolf mortalities were documented in the GYA in 2014, a decrease from the 71 wolf mortalities recorded in 2013. All of the documented mortalities except for one were human-caused. In 2014, 43 total wolves were harvested – 38 by hunters and 5 by trappers. Harvested wolves that were not clearly accounted for by a particular pack, or were harvested in MT but belonged to a pack accounted for by another state, were included as misc/lone (Table 1b). Other human-related mortalities included three wolves killed under the newly-enacted Senate Bill 200, one killed in a vehicle collision, one illegally trapped outside of the trapping season, one WS capture-related mortality, and one legally harvested on tribal land. One wolf, a radio-collared disperser from Wyoming (wolf 859M), found to have died of natural causes, was likely injured by ungulate prey. All wolves killed in agency control actions or legally harvested

are precise numbers, while the number of mortalities from all other causes is a minimum that MFWP documented. The actual number is unknown. Further, these numbers can only be applied to an overall population count because they are known numbers, not comparable to the minimum count which is a portion of the total population (minimum verified).

One dispersal was documented for the MT GYA population in 2014. SW3018 dispersed from the Beartrap pack to join the Romey Lake pack.

Miscellaneous/ Lone individuals:

Crow Tribal Land: there was one collared lone wolf that was legally killed on the Crow Reservation (wolf 869M originating from the Junction Butte Pack).

Paradise Valley: WY disperser 859M died of natural causes in winter 2014, and appeared to have died from blunt trauma to the ribs. Another uncollared black female thought to be part of a new pair was killed by a hunter in southern Paradise Valley.

Gardiner to Cook City area: Five wolves were killed by hunters near the Yellowstone boundary. 689M Cougar Creek pack, 889F (loner), and a yearling gray from the Junction Butte pack in Yellowstone. Additionally, two uncollared wolves were killed by hunters near the boundary.

Gallatin/ Madison: Three lone wolves were harvested by hunters in the Madison valley and one wolf was harvested in the upper Gallatin.

Centennial Valley: One lone wolf was legally harvested by a hunter in the centennial valley.

Tobacco Root Mountains: One lone wolf was legally harvested in the North Tobacco root mountains prior to the formation of the Carmichael pack.

Suspected Packs

Bull Mountains: FWP received a small number of reports of wolves in the Bull Mountains near Whitehall. Field efforts are ongoing to determine whether a pack is establishing or if dispersers were passing through.

Highlands: FWP received a small number of reports of wolves in the Highland Mountains. The Table Mountain pack was no longer present. Field efforts are ongoing to determine whether a pack is establishing or if dispersers were passing through.

Smith River Valley: FWP received scattered reports of wolves in the Smith River Valley between the Big Belt and Little Belt Mountains. Field efforts are ongoing to determine whether a pack is establishing or if dispersers were passing through.

Southeast end of the Crazy Mountains: FWP received reports in the area of the southeastern end of the Crazies, but was unable to verify any wolf sign after extensive searching.

Flathead Pass area (N. Bridgers): A small number of reports came in for wolf sightings in this area. FWP was not able to verify wolf activity in the area but will continue to attempt to document wolf presence.

OUTREACH AND EDUCATION

FWP's wolf program outreach and education efforts are varied, but significant. Outreach activities take a variety of forms including; field site visits, phone and email conversations to share information and answer questions, media interviews, formal and informal presentations. FWP also prepared and distributed a variety of printed outreach materials and media releases to help Montanans become more familiar with the Montana wolf population and the state plan. An increasingly important aspect of outreach is the Internet.

The "Report a Wolf" application continued to generate valuable information from the public in monitoring efforts for existing packs and documenting wolf activity in new areas. Several hundred reports were received through the website. Countless more were received via postal mail and over the phone.

Most wolf program staff spent some time at hunter check stations in FWP Regions 1-5 to talk with hunters about wolves, wolf management, and their hunting experiences.

LAW ENFORCEMENT

All wolf mortalities that are not the result of an authorized agency lethal control, a shoot on sight permit, a legal sport harvest, a vehicle/train strike or apparent natural causes, are reported to law enforcement personnel. These mortalities are under investigation until a full determination is made regarding cause of death and any potential criminal activity.

The USFWS Office of Law Enforcement was the lead agency to investigate wolf deaths until delisting in May 2011. Upon delisting, FWP personnel led law enforcement efforts for state-based laws, rules, and FW Commission regulations.

There are a few ongoing FWP cases of illegal take during the 2014-15 hunting season. We cannot give any details because cases are ongoing. In FWP's Region Two, southwest Montana, two trappers have been charged with violations and expected to go to trial soon. In FWP's Region Four, northcentral Montana, there is one case of illegal take of a wolf. The wolf was seized but there is no trial date yet.

FUNDING

Montana Fish, Wildlife & Parks

A five-year funding agreement between the USFWS and FWP was signed in 2011, and $390,908 was obligated for Federal Fiscal Year 2013 (October 1, 2013 - September 30, 2014, includes indirect costs). In the 2011 Montana Legislative session, House Bill 363 became law. This law requires that a wolf management account be set up and that all wolf license revenue be deposited into this account for wolf collaring and control. Specifically, it states that subject to appropriation by the legislature, money deposited in the account must be used exclusively for the management of wolves and must be equally divided and allocated for the following purposes:

(a) wolf-collaring activities conducted pursuant to 87-5-132; and

(b) lethal action conducted pursuant to 87-1-217 to take problem wolves that attack livestock.

Senate Bill 348 also passed during the 2011 Montana Legislative session. SB 348 requires FWP to allocate $900,000 toward wolf management. "Management" includes the entire range of activities that constitute a modern scientific resource program, including but not limited to research, census, law enforcement, habitat improvement, control, and education. The term also includes the periodic protection of species or populations as well as regulated taking.

In summary, wolf management funding for state fiscal year 2014 (July 1, 2013 – June 31, 2014) consists of the $390,908 of federal money from the USFWS cooperative agreement, $153,102 of federal PR funds, and $390,075 of state license dollars.

Funding is and will primarily be used to pay for FWP's field presence to implement population monitoring, collaring, outreach, hunting, trapping, and livestock depredation response. In addition to the ongoing efforts by Montana FWP wolf specialists, additional efforts to meet the intent of SB 348 and HB 363 include:

- The wolf program increased to a total of 5.5+ FTE in fiscal year 2012 (wolf specialists dedicated to wolf management plus seasonal technicians and volunteers). Those staffing levels continued in 2014.
- FTE's were added for technicians in Region 1 and Region 2, during fiscal year 2012, to increase collaring efforts in wolf packs associated with livestock. Those staffing levels were continued during 2014.
- Funding was dedicated for aerial darting and collaring of wolves in the Madison, Gallatin, and Yellowstone drainages where conflicts with grizzly bears limit trapping and collaring efforts.
- Renewed agreement with Wildlife Services and commitment of $110,000 towards wolf management efforts.

Other management services provided by FWP include law enforcement, harvest/quota monitoring, legal support, public outreach, and overall program administration. Exact cost figures have not been quantified for the value of these services.

USDA Wildlife Services

Wildlife Services (WS) is the federal agency which assists FWP with wolf damage management. WS personnel conduct investigations of injured or dead livestock to determine if it was a predation event and, if so, what predator species was responsible for the damage. Based on WS determination, livestock owners may be eligible to receive reimbursement through the Montana Livestock Loss Program. If WS determines that the livestock depredation was a confirmed wolf kill or was a probable wolf kill, the livestock owner is eligible for 100% reimbursement on the value of the livestock killed based on USDA market value at the time of the investigation.

Under an MOU with FWP, the Blackfeet Nation (BN), and the Confederated Salish and Kootenai Tribes (CSKT); WS conducts the control actions on wolves as authorized by FWP, BN, and CSKT. Control actions may include radio-collaring and/or lethal removal of wolves implicated in livestock depredation events. FWP, BN, and CSKT also authorizes WS to opportunistically radio-collar wolf packs that do not have an operational radio-collar attached to a member of the pack.

As a federal agency, WS receives federal appropriated funds for predator damage management activities but no funding directed specifically for wolf damage management. Prior to Federal Fiscal Year (FFY) 2011, the WS Program in Montana received approximately $250,000 through the Tri-State Predator Control Earmark, some of which was used for wolf damage management operations. However, that earmark was completely removed from the federal budget for FFY 2011 and not replaced in FFY 2012-2014.

In FFY 2014, WS spent $285,198 conducting wolf damage management in Montana (not including administrative costs), a $92,034 decrease from the total spent in FFY 2012. The FFY 2013 expenditure included $138,548 Federal appropriations, $110,000 from FWP, $25,000 from the Rocky Mountain Elk Foundation, and $11,650 from Montana livestock producers.

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USDA APHIS WS investigates all suspected wolf depredations on livestock and under the authority of FWP, carries out all livestock depredation-related wolf damage management activities in Montana. We thank them for contributing their expertise to the state's wolf program and for their willingness to complete investigations and carry out lethal control and radio-collaring activities in a timely fashion. We also thank WS for assisting with monitoring wolves in Montana. WS personnel involved in wolf management in Montana in 2013 included the state director John Steuber, western district supervisor Kraig Glazier, eastern district supervisor Mike Foster, western assistant district supervisor Chad Hoover, eastern assistant district supervisor Alan Brown, wildlife disease biologist Jerry Wiscomb, helicopter pilots Tim Graff and Eric Waldorf, helicopter/airplane pilot Stan Colton, wildlife specialists Denny Biggs, John Bouchard, Joe Carpenter, Steve DeMers, Mike Hoggan, John Maetzold, Graeme McDougal, John Miedtke, Kurt Miedtke, Brian Noftsker, Ted North, Jim Rost, Bart Smith, Pat Sinclair, Mike Thomas, and Dan Thomason.

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APPENDIX 1

MONTANA CONTACT INFORMATION

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(to request investigations of injured or dead livestock):
John Steuber
USDA WS State Director, Billings
(406) 657-6464 (w)

Kraig Glazier
USDA WS West District Supervisor, Helena
(406) 458-0106 (w)

Mike Foster
USDA WS East District Supervisor, Columbus
(406) 657-6464 (w)

TO REPORT A DEAD WOLF OR POSSIBLE ILLEGAL ACTIVITY:

Montana Fish, Wildlife & Parks

- Dial 1-800-TIP-MONT (1-800-847-6668) or local game warden

TO SUBMIT WOLF REPORTS ELECTRONICALLY AND TO LEARN MORE ABOUT THE MONTANA WOLF PROGRAM, SEE:

- http://fwp.mt.gov/fishAndWildlife/management/wolf/

MONTANA FISH WILDLIFE & PARKS ADMINISTRATIVE REGIONS

STATE HEADQUARTERS
MT Fish, Wildlife & Parks
1420 E 6th Avenue
PO Box 200701
Helena, MT 59620-0701
(406) 444-2535

REGION 1
490 N Meridian Rd
Kalispell, MT 59901
(406) 752-5501

REGION 2
3201 Spurgin Rd
Missoula, MT 59804
(406) 542-5500

REGION 3
1400 South 19th
Bozeman, MT 59718
(406) 994-4042

HELENA Area Res Office (HARO)
930 Custer Ave W
Helena, MT 59620
(406) 495-3260

BUTTE Area Res Office (BARO)
1820 Meadowlark Ln
Butte, MT 59701
(406) 494-1953

REGION 4
4600 Giant Springs Rd
Great Falls, MT 59405
(406) 454-5840

LEWISTOWN Area Res Office (LARO)
215 W Aztec Dr
PO Box 938
Lewistown, MT 59457
(406) 538-4658

REGION 5
2300 Lake Elmo Dr
Billings, MT 59105
(406) 247-2940

APPENDIX 2

Gray Wolf Chronology in Montana

2011

- In April, President Obama signed the Department of Defense and Full-Year Appropriations Act, 2011. A section of that Appropriations Act directed the Secretary of the Interior to reissue within 60 days of enactment the final rule published on April 2, 2009, that identified the Northern Rocky Mountain (NRM) population of gray wolf (*Canis lupus*) as a distinct population segment (DPS) and to revise the List of Endangered and Threatened Wildlife by removing most of the gray wolves in the DPS.
- May 5, the USFWS published the final delisting rule which designates the NRM distinct population segment and delisted the gray wolf throughout the DPS except WY. Wolves in MT are classified as a species in need of management statewide under Montana law; state rules and the state management plan take full effect. The Service and the states will monitor wolf populations in the Northern Rocky Mountain DPS and gather population data for at least five years.
- In May, the FWP Commission proposed regulations for a 2011 take season. Public comment was taken during June.
- In June, Alliance for the Wild Rockies, Friends of the Clearwater, Wildearth Guardians, Center for Biological Diversity, Cascadia Wildlands, and Western Watersheds Project filed a lawsuit challenging the constitutionality of the Congressional rider under the Separation of Powers clause of the U.S. Constitution. The lawsuit was filed in the Missoula Federal District Court. FWP submitted amicus curiae briefs.
- Commission adopted the 2011 wolf quotas in July. The statewide quota was 220.
- August 3, Judge Molloy upheld the constitutionality of the Congressional rider delisting wolves throughout the DPS except WY.
- August 8, the group of plaintiffs composed of the Alliance for the Wild Rockies, Friends of the Clearwater, and Wildearth Guardians filed a notice of appeal to the 9th Circuit.
- August 12, the second group of plaintiffs, Center for Biological Diversity, Cascadia Wildlands, and Western Watersheds Project, filed a notice of appeal to the 9th Circuit challenging Judge Molloy's decision.
- In August, Secretary of the Interior Ken Salazar and U.S. Fish and Wildlife Service Director Dan Ashe announced that the Service had reached an agreement that if implemented would promote the management of a stable, sustainable population of wolves and pave the way for the Service to return wolf management to Wyoming.
- August 8, wolf license sales began in Montana.
- In August, The Alliance for the Wild Rockies group of plaintiffs made an emergency motion for an injunction in the 9th Circuit to stop the wolf hunt.
- In August, The State of Montana and the FWP filed an amicus curiae brief in support of the federal Defendants and Appellees, Ken Salazar, Dan Ashe, and the United States Fish and Wildlife Service (Federal Defendants) opposition to the emergency motion to stop the planned wolf hunting season in Montana and Idaho.
- September 3, archery hunting opens in all of the 14 wolf management units in Montana. Archery and general season hunts scheduled to end December 31 in all 14 units.
- In December, the Montana Fish, Wildlife and Parks Commission extends the wolf season in any units with unmet quotas to February 15, 2012
- December 31, 121 wolves legally harvested in Montana during the 2011 season. Season remains open until February 15, 2012 in all but 2 of the 14 units.

- An estimated minimum of 653 wolves with 39 breeding pairs are counted in Montana. Distribution continues to be primarily in the western one-third of Montana.

2012

- May 10, the FWP Commission proposed regulations for a 2012 take season. Public comment was taken during June.
- July 12, the Commission adopted the 2012 wolf general season framework (no statewide quota) that included a trapping season; bag limit of 3 wolves (up to 3 via trapping and 1 via hunting); and included authorization of a 3 wolf hunting bag limit and electronic calls with legislation.
- September 8, FWP instructs the first wolf trapper education course in Montana.
- October 11, the FWP Commission proposed a trap pan tension rule for wolf trappers to minimize non-target captures.
- November 8, the FWP Commission adopted the final trap pan tension rule for wolf trappers to minimize non-target captures.
- December 8, wolf trapper education is completed for the year in Montana, with 2,414 students completing the course.
- December 15, the first Montana trapping season opens.
- An estimated minimum of 625 wolves and 37 breeding pairs are counted in Montana.

2013

- May 9, the FWP Commission proposed regulations for a 2013-14 take season. Public comment was taken during June.
- July 10, the Commission adopted the 2013-14 wolf general season framework that included a trapping season and a bag limit of 5 wolves per person.
- An estimated minimum of 627 wolves and 27 breeding pairs are counted in Montana.

2014

- May 22, the FWP Commission proposed regulations for a 2014-15 wolf season. Public comment was taken during June.
- July 10, the Commission adopted the 2014-15 wolf general season framework that included a trapping season and a bag limit of 5 wolves per person.
- An estimated minimum of 554 wolves and 34 breeding pairs are counted in Montana.

APPENDIX 3

RESEARCH, FIELD STUDIES, AND PROJECT PUBLICATIONS

Each year in Montana, there are a variety of wolf-related research projects and field studies in varying degrees of development, implementation, or completion. These efforts range from wolf ecology, predator-prey relationships, wolf-livestock relationships, policy, or wolf management. Additionally, the findings of some completed projects get published. The 2013 efforts are summarized below, with updates or project abstracts.

1). Predicting abundance of gray wolves in Montana using hunter observations and field monitoring

Principal Investigator: Kevin Podruzny

Note: *At the time of the Annual Wolf Report writing (3/26/15) there is not an update of this project available. However, the project is ongoing and what follows is taken from the 2013 Annual Report.*

Since the early 1980's, as wolf populations began recovering in Montana, the numbers of packs, breeding pairs, and total wolves have been documented by attempting to locate and count all individuals. It was assumed that these minimum counts provided an index to the true populations when wolf numbers were small. In the early years, most wolf packs had radio-collared individuals, and intensive monitoring was possible to identify new packs and most individuals within packs. Only verified observations were used, thus these counts represented minimums. In 1995, when the US Fish and Wildlife Service reintroduced wolves into Yellowstone National Park and central Idaho, the end-of-year count for wolves residing in Montana was only 66. By 2012 the minimum count had reached 625. The capacity for MFWP personnel to monitor a larger and rapidly growing wolf population has been declining given robust wolf population growth since about 2006. The traditional field-based methods yield minimum counts that are conservative and inevitably (and probably increasingly) below the true population sizes, and the degree of undercount is unknown. Consequently, MFWP explored other, cost-effective methods that could more accurately be described as population estimates that account for uncertainty, as opposed to minimum counts.

In anticipation of an increased work load and declining federal funding, MFWP first began considering alternative approaches to monitoring the wolf population in 2006. Preliminary work focused on developing a more reliable and cost-effective method to estimate the number of breeding pairs based on the size of a wolf pack using logistic regression models (Mitchell et al. 2008). Subsequent work focused on finding ways to utilize wolf observations by hunters in a more systematic way. A collaborative research effort with the University of Montana Cooperative Wildlife Research Unit was initiated in 2007. The primary objective was to find an alternative approach to wolf monitoring that would yield statistically reliable estimates of the number of wolves, the number of wolf packs, and the number of breeding pairs (Glenn et al. 2011). Ultimately, a method applicable to a sparsely distributed and elusive carnivore population was developed that used hunter observations as a cost effective means of gathering

biological data to estimate the area occupied by wolves in Montana, and additional information gathered from field monitoring by biologists to estimate the number of packs (Rich et al. 2013).

This transitioning from labor intensive minimum counts that are biased low to an unknown degree to obtaining population estimates can be fine tuned and modified as new data and methodologies become available, new techniques are developed, and new research answers key uncertainties. This technique bypasses the need to count every individual in every pack, and instead relies on public reported wolf observations, field-documented territory size, and a small number of monitored packs and pack sizes.

Methods

The general method we used to estimate the number of gray wolves in Montana was to 1) estimate the area occupied by wolves in packs, 2) estimate the numbers of wolf packs by dividing area occupied by average territory size and correcting for overlapping territories, and 3) estimate the numbers of wolves by multiplying the number of estimated packs by average annual pack size (Figure 2).

Estimating Area Occupied by Wolves in Packs

To estimate the area occupied by wolf packs from 2007 to 2012, we used a multi-season false-positives occupancy model (Miller et al. 2013) using program PRESENCE (Hines 2006). First, we created an observation grid for Montana (Figure 2A) with a cell size large enough to ensure observations of packs across sample periods, yet small enough to minimize the occurrences of multiple packs in the same cell on average (cell size = 600 km^2). We used locations of wolves in packs (2-25 wolves) reported by a random sample of unique deer and elk hunters during MFWP annual Hunter Harvest Surveys (Figure 2B) and assigned the locations to cells (Figure 2C). We modeled detection probability, initial occupancy, and local colonization and local extinction from 5, 1-week encounter periods and verified locations (Figure 2D) using covariates that were summarized at the grid level (Figure 2E). We estimated patch-specific estimates of occupancy (Figure 2F) and estimated the total area occupied by wolf packs by multiplying patch-specific estimates of occupancy by their respective patch size and then summing these values across all patches (Figure 2G). Our final estimates of the total area occupied by wolf packs were adjusted for partial cells on the border of Montana and included model projections for reservations and national parks where no hunter survey data were available.

Model covariates for detection included hunter days per hunting district per year (an index to spatial effort), low use forested and non-forested road densities (indices of spatial accessibility), a spatial autocovariate (the proportion of neighboring cells with wolves seen out to a mean dispersal distance of 100 km), and patch area sampled (because smaller cells on the border of Montana, parks, and Indian Reservations have less hunting activity and therefore less opportunity for hunters to see wolves). Model covariates for occupancy, colonization, and local extinction included a principal component constructed from several autocorrelated environmental covariates (percent forest cover, slope, elevation, latitude, percent low use forest roads, and human population density), and recency (the number of years with verified locations in the previous 5 years).

To estimate area occupied in each year, we calculated unconditional estimates of occupancy probabilities which provided probabilities for sites that were not sampled by Montana hunters (such as National Parks and Reservations). We accounted for uncertainty in occupancy estimates using a parametric bootstrap procedure on logit distributions of occupancy probabilities. For each set of bootstrapped estimates we calculated area occupied. The 95% confidence intervals (C.I.s) for these values were obtained from the distribution of estimates calculated from the bootstrapping procedure.

Estimating Numbers of Wolf Packs

To predict the total number of wolf packs in Montana from 2007 to 2012, we first established an average territory size for wolf packs in Montana (Figure 2H). Rich et al. (2012) calculated 90% kernel home ranges from radio telemetry locations of wolves collared and tracked by wolf MFWP biologists for research and/or management from 2008 to 2009. We assumed the mean estimate of territory size from these data was constant during 2007-2012. For each year, we estimated the number of wolf packs by dividing our estimates of total area occupied by the mean territory size (Figure 2I). We then accounted for annual changes in the proportion of territories that were overlapping (non-exclusive) using the number of observed cells occupied by verified pack centers.

We accounted for uncertainty in territory areas using a parametric bootstrap procedure and a log-normal distribution of territory sizes, and for each set of bootstrapped estimates we calculated mean territory size. The 95% C.I.s for these values were obtained from the distribution of estimates calculated from the bootstrapping procedure.

Estimating Numbers of Wolves

To predict the total number of wolves in Montana from 2007 to 2012, we first calculated average pack size from the distribution of packs of known size (Figure 2J). Pack sizes were established by MFWP biologists for packs monitored for research and/or management. We used end-of-year pack counts for wolves documented in Montana from 2007 to 2012. We only used pack counts MFWP biologists considered complete. Typically, intensively monitored packs with radio-collars provided good counts more often than packs that were not radio-marked. For each year, we estimated total numbers of wolves in packs by multiplying the estimate of mean pack size by the annual predictions of number of packs (Figure 2K).

We accounted for uncertainty in pack sizes using a parametric bootstrap procedure and a Poisson distribution of pack sizes, and for each set of bootstrapped estimates we calculated mean pack size. The 95% C.I.s for these values were obtained from the distribution of estimates calculated from the bootstrapping procedure. We allowed pack sizes to vary by year but not spatially.

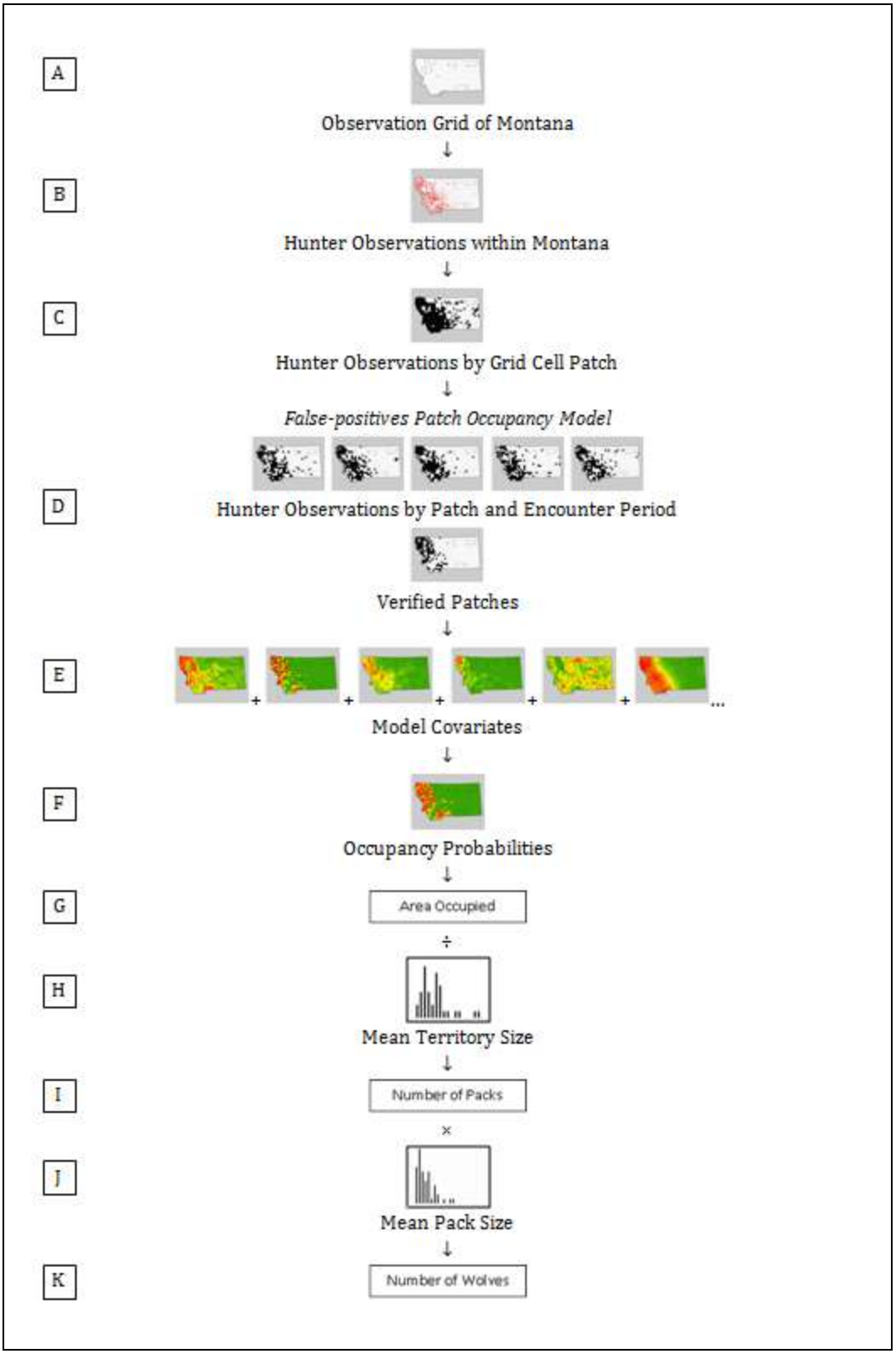

Figure 2. Schematic for method of estimating the area occupied by wolves, number of wolf packs and number of wolves in Montana, 2007-2012.

Results

Estimating Area Occupied by Wolves in Packs

From 2007 to 2012, 50,039, 81,475, 80,486, 82,386, 81,532 and 76,996 hunters responded to the wolf sighting surveys. From their reported sightings, 1,202, 2,859, 3,056, 3,469, 3,320, and 2,391, locations of 2 to 25 wolves could be determined during the 5, 1-week sampling periods.

The top model of wolf occupancy showed positive associations between the initial probability that wolves occupied an area and an environmental principal component and recency. The probability that an unoccupied patch became occupied in subsequent years was positively related to an environmental principal component and recency. The probability that an occupied patch became unoccupied in the following year was constant. The probability that wolves were detected by a hunter during a 1-week sampling occasion was positively related to hunter days per hunting district per year, low use forest road density, low use non-forest road density, a spatial autocovariate, and area sampled. The probability that wolves were falsely detected by a hunter during a 1-week sampling occasion was positively related to hunter days per hunting district per year, low use forest road density, low use non-forest road density, and a spatial autocovariate

From 2007 to 2012, estimated area occupied by wolf packs in Montana increased from 39,521 km^2 (95% CI = 39,144 to 40,562) to 79,275 km^2 (95% CI = 78,696 to 79,944; Table 1). The predicted distribution of wolves from the occupancy model closely matched the distribution of field-confirmed wolf locations (verified pack locations and harvested wolves; Figure 3).

Table 1. Estimated area occupied by wolves, number of wolf packs, and number of wolves in Montana, 2007-2012.

	2007	2008	2009	2010	2011	2012
Estimated Area Occupied (km^2)	39,521	49,831	59,067	64,810	72,134	79,275
(95% C.I.)	(39,144 - 40,562)	(49,298 - 50,593)	(58,542 - 59,814)	(64,277 - 65,476)	(71,606 - 72,871)	(78,696 - 79,944)
Territory Size (km^2)	599.83	599.83	599.83	599.83	599.83	599.83
(95% C.I.)	(493.35 - 740.34)	(493.35 - 740.34)	(493.35 - 740.34)	(493.35 - 740.34)	(493.35 - 740.34)	(493.35 - 740.34)
Estimated Packs (600 km^2 territories)	66	83	98	108	120	132
(95% C.I.)	(54 - 81)	(67 - 101)	(80 - 120)	(87 - 131)	(97 - 146)	(107 - 160)
Territory Overlap Index	1.17	1.11	1.13	1.16	1.24	1.25
Estimated Packs (600 km^2 territories w/overlap)	77	93	112	126	149	165
(95% C.I.)	(63 - 95)	(75 - 113)	(90 - 136)	(102 - 153)	(121 - 181)	(134 - 201)
Average Pack Size (complete counts)	7.03	6.82	6.39	6.16	5.67	4.86
(95% C.I.)	(6.06 - 7.97)	(6.18 -7.65)	(5.75 - 7.10)	(5.46 - 6.86)	(5.05 - 6.28)	(4.27 - 5.51)
Estimated Wolves	542	631	713	774	843	804
(95% C.I.)	(422 - 688)	(503 - 796)	(570 - 888)	(612 - 965)	(664 - 1,056)	(636 - 1,019)

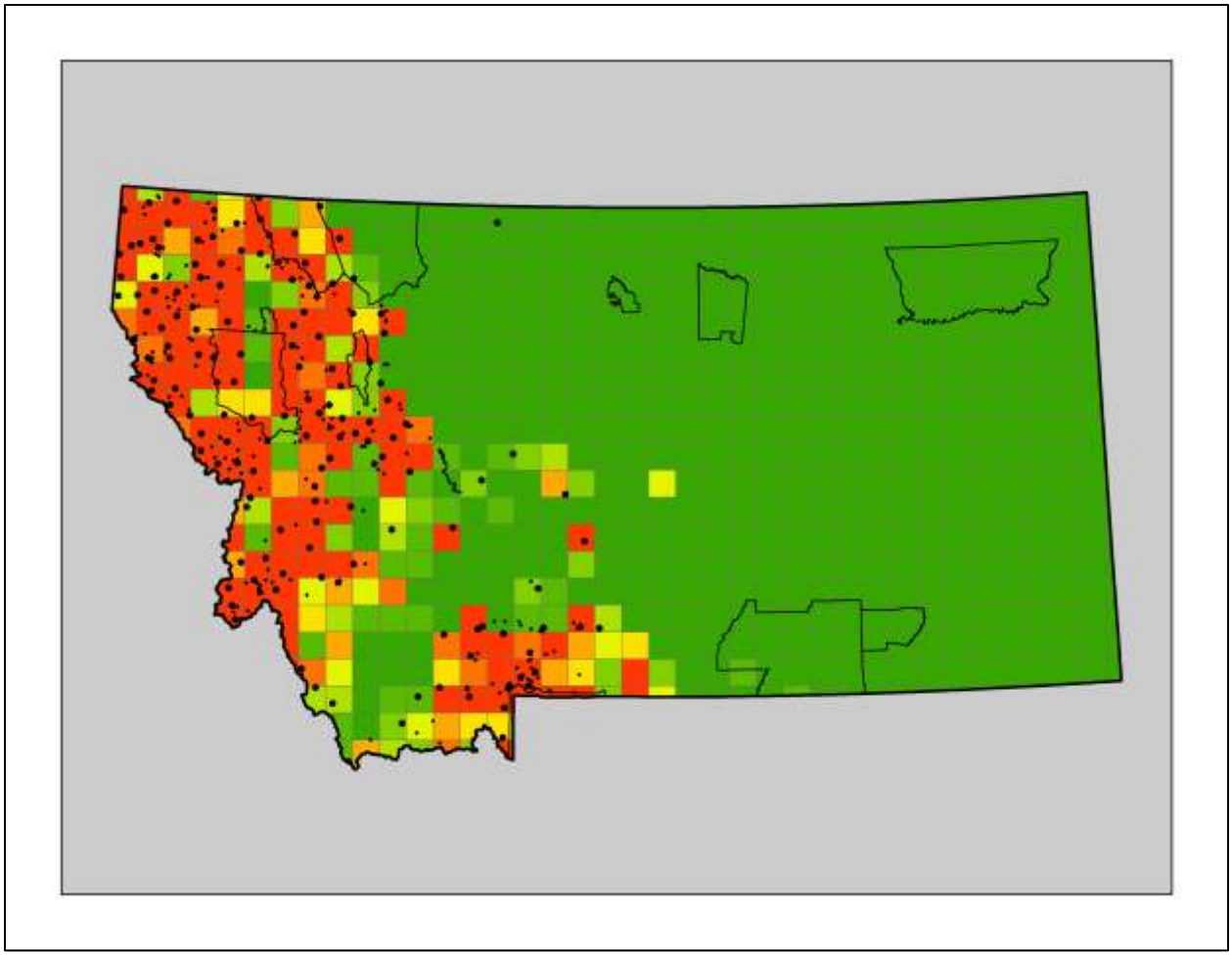

Figure 3. Model predicted probabilities of occupancy (ranging from low to high [green to red]), verified pack centers (large dots), and harvest locations (small dots) in Montana, 2012.

Estimating Numbers of Wolf Packs

In 2008 and 2009, territory sizes from 38 monitored packs ranged from 104.70 km^2 to 1771.24 km^2. Mean territory size was 599.83 km^2 (95% C.I. = 478.81 to 720.86; Rich et al. 2012). Dividing the estimated area occupied by mean territory size resulted in an estimated number of packs that increased from 66 (95% C.I. = 54 to 81) to 132 (95% C.I. = 107 to 160) from 2007 to 2012 (Table 1). We adjusted these estimates to account for annual changes in the number of verified pack centers per grid from 2007 to 2012 (1.17, 1.11, 1.13, 1.16, 1.24, and 1.25 for each respective year during 2007-2012) as an index of territory overlap. Accounting for territory overlap, estimated numbers of packs increased from 77 (95% C.I. = 63 to 95) to 165 (95% C.I. = 134 to 201) from 2007 to 2012 (Table 1). The estimated number of wolf packs ranged from 6% larger than the minimum verified number of packs residing in Montana in 2007 to 16% larger in 2010 (Figure 4).

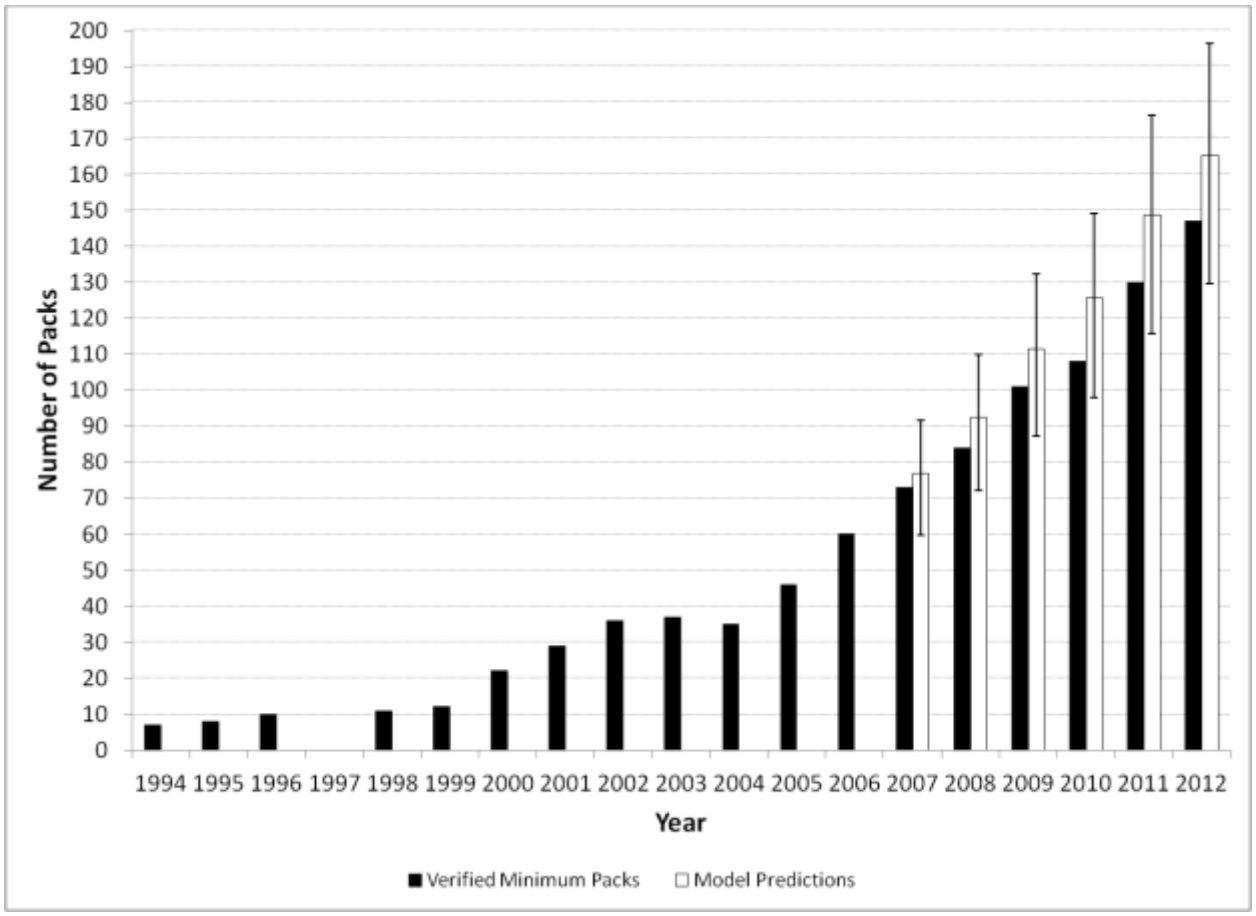

Figure 4. Estimated number of wolf packs in Montana compared to the verified minimum number of packs residing in Montana, 2007-2012.

Estimating Numbers of Wolves

From 2007 to 2012, complete counts were obtained from 314 packs within or bordering Montana. Pack sizes ranged from 2 to 22 and from 2007 to 2012 mean pack sizes decreased from 7.03 (95% C.I. = 6.06 to 7.97) to 4.86 (95% C.I. = 4.27 to 5.51). Multiplying estimated packs by mean pack size resulted in an increase of estimated wolves from 542 (95% C.I. = 422 to 688) to 804 from (95% C.I. = 636 to 1,019) 2007 to 2012 (Table 1). The estimated number of wolves ranged from 27% larger than the minimum verified number of wolves in Montana packs in 2008 to 37% larger in 2010 (Figure 5).

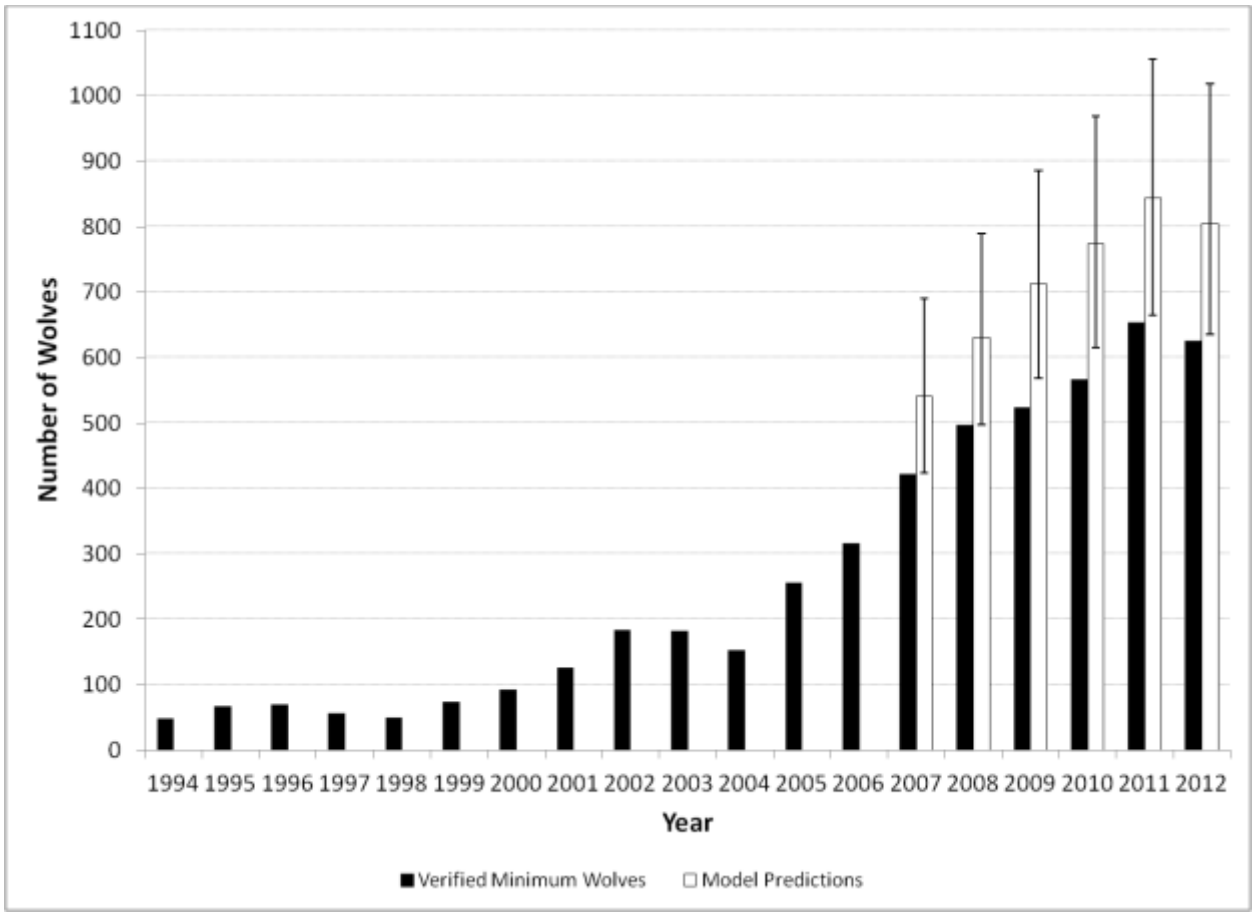

Figure 5. Estimated number of wolves in Montana compared to the verified minimum number of wolves residing in Montana, 2007-2012.

Discussion

Estimated Area Occupied by Wolves in Packs

Although the estimated area occupied has doubled between 2007 and 2012, the rate of growth for the area occupied has been declining. The extent to which this declining rate of increase represents a population responding to density dependent factors as available habitats become filled, versus a response to hunting and trapping harvest, is unknown.

Estimated Numbers of Wolf Packs

Our estimate for total numbers of wolf packs exceeded the minimum count by 6 to 16% between 2007 and 2012. Such a level of undercount is not unreasonable for elusive carnivores and is within the range of imperfect detection recorded for many other wildlife species and population estimation methods. For example, detection rates of elk during aerial surveys can be less than 20% (e.g., Vander Wal et al 2011), and detection rates of elk during winter surveys on the open winter ranges in southwestern Montana have been estimated at 44-89% (Hamlin and Ross 2002). Becker et al. (1998) produced a population estimate 48% higher than the number of individual

wolves they observed, even though they assumed that they detected all wolf tracks in the area they surveyed.

Our estimate of the number of wolf packs assumes that territory size is constant and equal across space. If territory sizes were actually larger in some years or some areas, then the estimated number of packs in those years or areas would have been biased high, and if territory sizes were actually smaller in some years or some areas, then the pack estimates would have been biased low in those years or areas. Similarly, our estimates of territory overlap were indirect indices rather than field-based observations based on high-quality telemetry data. In future applications of this technique, the assumption of constant territory sizes could be relaxed by modeling territory size as a flexible parameter, incorporating estimates of inter-pack buffer space or territory overlap into estimates of exclusive territory size, and incorporating spatially and temporally variable territory size predictions into estimates of pack numbers.

The estimated number of packs exceeded the minimum number of verified packs to some degree because verified packs did not include border packs attributed to other states or Canada that spent time in Montana and could have been recorded by hunters. We only included verified border packs included in the Montana summaries in comparing our estimates to minimum counts. Also, the minimum number of packs verified was for the end of the year, and wolf population estimates derived from hunter observations represented the deer and elk hunting season in October- November, a period of time before some natural and human-caused wolf mortalities occurred.

Estimated Numbers of Wolves

Our estimate for total numbers of wolves exceeded the minimum count by to 37% between 2007 and 2012. The degree of difference exceeds that of packs because in addition to undocumented packs, it incorporates undocumented individuals within known packs. This degree of difference between minimum counts and our population estimate remains within that observed in other studies of wolves (Becker et al. 1998) or more common ungulate species (Hamlin and Ross 2002, Vander Wal et al. 2011).

Our estimate of the number of wolves is dependent on several assumptions that need to be examined further. First, our population estimate assumes that missed packs are the same size as verified packs. If missed packs are smaller (e.g., recently established packs or packs interspersed among known packs), then our estimated number of wolves would be biased high. Also, our estimate assumes that pack size is constant and equal across space. Pack sizes that were actually larger in some years or some areas would induce a negative bias in our estimates of wolves in those years or areas, and pack sizes that were actually smaller in some years or some areas would induce a positive bias in our estimates of wolves in those years or areas. Finally, our population estimate is for wolves in groups of 2 or more and does not factor lone or dispersing wolves into the population estimate. Various studies have documented that on average 10-15% of wolf populations are composed of lone or dispersing wolves (Fuller et al. 2003). The state of Idaho inflates their estimates by 12.5% to account for lone wolves (Idaho Department of Fish and Game and Nez Perce Tribe 2012) and Minnesota inflates their estimate by 15% (Erb 2008). In

the future, lone or dispersing wolves could be incorporated into the Montana population estimate in various manners.

The estimated number of wolves exceeded the minimum number of verified wolves to some degree because verified wolves did not include individuals associated with border packs attributed to other states or Canada that spent time in Montana and could have been observed by hunters. As with packs, the minimum number of wolves verified was for the end of the year, and wolf population estimates derived from hunter observations represented a period of time before some natural and human-caused mortalities occurred.

Future applications of this modeling and population estimation technique will include incorporation of harvest (locations and number of harvested wolves) effects on wolf occupancy, territory sizes and overlap, and pack sizes. Incorporation of harvest as a model covariate for each of these aspects of wolf population size will enable a formal assessment of the effects of harvest on wolf populations in Montana. This strategy will also allow for predictions of the effects of different seasons or harvest quotas on wolf populations, to provide information to decision makers as they set wolf hunting and trapping seasons in coming years. Therefore, in addition to its use for monitoring and wolf population estimation, the technique described here also will provide utility for directly informing decisions about public harvest of wolves.

2). Efficacy of wolf removal in reducing recurrence of depredation on livestock in Montana, Wyoming and Idaho

Investigators: Kyran Kunkel (University of Montana), Liz Bradley and Justin Gude (Montana Fish, Wildlife & Parks), Hugh Robinson (Panthera), Carolyn Sime (University of Montana), Ed Bangs and Mike Jimenez (US Fish & Wildlife Service), Todd Grimm (USDA Wildlife Services), Jim Holyan (Nez Perce Tribe), and Val Asher (Turner Endangered Species Fund).

Status: In Review, Journal of Wildlife Management

ABSTRACT Wolf (*Canis lupus*) predation on livestock and management methods used to mitigate conflicts are highly controversial and scrutinized especially where wolf populations are recovering. Wolves are commonly removed from a local area in attempts to reduce further depredations but the effectiveness of such management actions is poorly understood. We compared the effect of 3 management responses to livestock depredation by wolf packs in Montana, Idaho, and Wyoming: no removal, partial pack removal, and full pack removal. We examined the effectiveness of each management response in reducing further depredations using a conditional recurrent event model. From 1989 to 2008 we documented 967 depredations by 156 packs: 228 on sheep and 739 on cattle and other stock. Mean time between recurrent depredations was 115 days following no removal (median = 19 days, n = 593), 170 days following partial pack removal (median = 64 days, n = 326), and 753 days following full pack removal (median = 730 days, n = 48; recurring depredations were made by the next pack to occupy the territory). Compared to no removal, full pack removal reduced the occurrence of subsequent depredations by 79% (Hazard Ratio [HR] = 0.21, $P < 0.001$) over a span of 1,850 days (5 years), while partial pack removal reduced the occurrence of subsequent depredations by

29% (HR = 0.71, $P < 0.001$) over the same period. Partial pack removal was most effective if conducted within the first 7 days following depredation, after which there was only a marginally significant difference between partial pack removal and no action (HR = 0.86, P = 0.07), and no difference after 14 days (HR = 0.99, P = 0.93). Within partial pack removal, we found no difference in depredation recurrence when a breeding female [HR = 0.64, P = 0.2] or adult male was removed [HR = 1.0, P = 0.99]. The relative effect of all treatments was generally consistent across season (spring, summer grazing, or winter) and type of livestock. Ultimately, pack size was the best predictor of a recurrent depredation event; the probability of a depredation event recurring within 5 years increased by 7% for each animal left in the pack after the management response. However, the greater the number of wolves left in a pack, the higher the likelihood the pack met federal criteria to count as a breeding pair the following year toward population recovery goals.

3). Bitterroot elk project progress report – Spring 2014

Investigators: Dr. Kelly Proffitt, Craig Jourdonnais, Ben Jimenez, Liz Bradley, Mike Thompson, and Justin Gude, Montana Fish, Wildlife and Parks, Dr. Mark Hebblewhite, University of Montana

Montana Fish, Wildlife and Parks and the University of Montana recently completed the third and final year of a three-year project investigating the influence of predation, habitat, and nutrition on elk population dynamics in the southern Bitterroot Valley. During the third year of the study, we monitored cause-specific adult and calf elk survival. Adult mortalities included a combination of predation and non-predation, natural causes. Calf mortalities were primarily due to predation, and lion predation was the leading cause of calf mortality. Fieldwork on this project ended on May 31, 2014. During the upcoming fall and winter, we will be working to complete analyses of the past three years of elk survival and movement data.

Adult Elk Monitoring – Year 3

During the winter of 2012-13, we captured 41 adult female elk in the south Bitterroot study area. As in previous winters, these elk were instrumented with GPS/VHF collars that collected GPS locations at 30-minute intervals. Each elk was monitored for 12 months, and collars were programmed to drop off one year after the date of deployment. Collared elk generally exhibited similar movement patterns to previous years, with a few notable exceptions. Of the 20 elk captured in the East Fork area, eight migrated to the upper Big Hole in early May. Six of these elk eventually returned to the East Fork in late fall 2013. One elk that summered in the Big Hole migrated to the Salmon River drainage in Idaho in late fall and spent the 2013-2014 winter along the North Fork of the Salmon River. This was the first collared elk from our study to emigrate and winter in Idaho. One elk that summered in the Big Hole moved north of Mud Creek in hunting district 319 in late fall and has not returned to the study area. We are continuing to search adjacent elk ranges to locate this animal.

Adult Elk Survival – Year 3

Of the 41 adult female elk that were monitored during 2013-2014, four died during the one year monitoring period. One West Fork elk was killed by a mountain lion in March 2013, one by an

unknown predator in April 2013, and one other died of natural causes just after giving birth in early June 2013. One East Fork elk was hit by a vehicle while crossing highway 93 between Darby and Conner in November 2013. The Kaplan-Meier (KM) survival estimate for 2013 was 0.90. The estimated annual adult survival rate was 0.84 in 2011 and 0.95 in 2012.

Elk Calf Survival – Year 3

The third and final year of elk calf survival monitoring was completed on May 31, 2014. From May 27-June 16, 2013, project staff and volunteers captured newborn calves in the East and West Fork areas of the Bitterroot, and in the upper Big Hole Valley. Prior to the start of the calf capture, many of the radiocollared adult female elk migrated to the Big Hole, so we included this area in our capture efforts to mark calves from within the entire East Fork elk calving range. We captured a total of 84 elk calves, 42 in the West Fork area and 42 in the East Fork and upper Bighole. After completing the summer monitoring, field staff monitored calves 2 to 3 times per week from fall to spring, and conducted detailed mortality investigations at each mortality site. A winter elk calf capture was not required this year due to higher calf survival and fewer ear tag failures. In total, 17 calves had unknown fates due to tag loss (n = 11) or unknown censoring events (n = 6). Of the 68 known-fate calves, 36 died and 31 lived. The cause-specific mortality rates were 0.18 for lion predation, 0.04 for bear predation, 0.09 for unknown predation, 0.15 for unknown causes, 0.03 for natural, non-predation, and 0.01 for human-related mortality. The natural, non-predation causes included drowning and starvation. The human-related mortality was due to hunter harvest. We did not detect any wolf predation.

The KM survival estimate was 0.44 for calves in 2013-2014, the highest survival estimate among study years (2011 = 0.27, 2012 = 0.41). Overall, male calves had a 65.3% greater risk of mortality than females, and this difference did not depend on the study year. The KM survival estimates were 0.48 for females and 0.30 for males. The overall cause-specific mortality rates were 0.19 for lions, 0.04 for bears, 0.03 for wolves, 0.08 for unknown predator, 0.12 for unknown mortality, 0.04 for natural, non-predation, and 0.01 for human-related mortality.

Elk Habitat and Vegetation Monitoring

As part of the Bitterroot elk project, we are assessing elk forage availability and digestibility across the study area. This work has three main components; 1) Assessing *elk diet* during summer and winter by collecting elk pellet samples, 2) Assessing *elk forage biomass* availability across different landcover types during the peak of the growing season in July/August, and 3) Assessing *elk forage quality and plant phenology* during the growing season from April to October. For all three-research components, plant samples have been under analysis from 2012 and 2013 at the Washington State University Wildlife Habitat Nutrition Lab.

Summer 2012 elk diet analyses from pellet samples show that graminoids were the most important part of the diet of elk during summer in both the east and west fork areas, followed by forbs (wildflowers), and shrubs (see Figure 3). Key forage species for elk included the following top 5 graminoids; Carex (sedge) species, Poa, Agropyron, Festuca, and Stipa; Forbs, Lupinus, Balsamorhiza, Xerophyllum, Achillea, and Equisetum; and Shrubs, Mahonia, Shepherdia, Salix, Vaccinium and Symphoricarpos. Elk winter pellets and diet are currently being analyzed in the lab.

During 2012 and 2013 we sampled 236 vegetation plots during the peak of the growing season in 'biomass' plots. These locations were chosen using an adaptive, stratified-random sampling design based on landcover classes. Landcover classes included recent burns, agriculture and ranch land, seasonal wetlands, grasslands, and closed canopy forests. At these locations, we surveyed all vegetation along a 30 m transect, gathering information about both understory and overstory vegetation. We identified all species, measured shrub and tree density, and recorded other characteristics of each location, including landcover type. To sample biomass, we quantified ground cover classes within a 0.5 m2 quadrat, then cut all live and dead vegetation within the quadrat. We weighed the sample in the field and then weighed it again after drying to quantify the amount of biomass in an area. These biomass data will be used to understand how the distribution of key elk plant species (from the diet analyses) is affected by different landcover types, including fire, and geographic gradients in elevation. We will then be able to predict the distribution of forage biomass for key forage plants for elk throughout the study area.

For all ungulates like elk, it is not just the *amount* of food that is present, but *how digestible* the food is that determines the quality of forage. Digestibility is highest when plants first start growing, in wet years, at higher elevations, and different plant species (grasses, shrubs) have different digestibility. In particular, studies in the west have shown that digestibility of key elk forage species in the late summer and fall is critically important for elk. To estimate spatial and temporal variations in forage quality, we established 30 phenology plots stratified by key phonological drivers (elevation, open habitats) that we visited 3-6 times through the growing season from April 15 – October 15 in 2012 and 2013. Each time we visited the plot, we recorded the composition of the plant cover, identify all vegetative species present, record the phenophases of the vegetation (flowering, fruiting, etc), and estimated biomass. We also collected over 1000 plant samples from the key species identified using diet analyses at each of the plant stages (new, fruiting, flowering, etc.). These plant samples are now being analyzed for digestibility so we can understand how plant forage quality specifically changes over the growing season, and whether there are differences in habitats in the timing and quality of key elk forage plants.

Future Project Plans

The 2011 - 2014 elk study estimated adult and calf survival rates and cause-specific mortality. We found mountain lion predation is an important factor affecting both adult and calf elk survival. This will provide baseline information regarding elk survival and cause-specific mortality rates in the Bitterroot Valley before regional changes in mountain lion management have taken effect. We plan to return to the Bitterroot study area in 2016-2017 to estimate both mountain lion density and cause-specific elk calf mortality, and evaluate the extent to which changes in mountain lion harvest management affected mountain lion density and elk calf recruitment rates.

Acknowledgements

We thank the landowners that have allowed access for fieldwork and provided logistical support, and the organizations and individuals that have provided financial support for this project : Ravalli County Fish and Wildlife Association, Montana Bowhunters Association, Hellgate Hunters and Anglers, Rocky Mountain Elk Foundation, Safari Club International Foundation, Montana Outdoor Legacy Foundation, Western Montana Chapter of the Safari Club, the Shikar-

Safari Club International Foundation, the Pope and Young Club, Montana Mapping & GPS, McIntire-Stennis Foundation (USDA), NASA, the U. S. Forest Service, the MPG Ranch, and private donations from individuals in the community. This work was supported by the National Science Foundation EPSCoR program under Grant # EPS-1101342 within the Montana Institute on Ecosystems. Funding was provided by revenues from the sale of Montana hunting and fishing licenses and matching Federal Aid in Wildlife Restoration grants to Montana Fish, Wildlife and Parks. To learn more, please visit our website: http://fwp.mt.gov/fishAndWildlife/management/elk/bitterroot/default.html

4). Livestock guard dog project

Graduate Student: Daniel Kinka, Utah State University
Principal Investigator: Julie Young, Ph.D., USDA APHIS/ Utah State University
Collaborators: Nathan Lance and Mike Ross, Montana Fish, Wildlife & Parks

Note: *At the time of the Annual Wolf Report writing (3/30/15) there is not an update of this project available. However, the project is ongoing and what follows is taken from the 2013 Annual Report.*

In 2013 the USDA National Wildlife Research Center in collaboration with Utah State University began a project to investigate the effectiveness of certain breeds of livestock guard dogs (LGDs) as management tools for reducing domestic sheep depredations. In the spring of 2013, nine kangal-breed LGDs were placed with sheep producers in Montana through collaboration with Montana Fish, Wildlife and Parks (MT-FWP). The dogs were divided into trios and each trio was assigned to a band of sheep. In addition to the nine new LGDs, six existing LGDs were monitored. These existing dogs represented a number of LGD breeds and breed- crosses including Akbash, Great Pyrenees, and Maremma.

Monitoring of LGDs lasted from May 15 – October 1, 2013. During that time data were collected on sheep mortalities and LGD behavior as well as spatial information on LGDs, sheep, wolf, and grizzly bears (see project statistics below). Sheep mortalities were investigated opportunistically with the assistance of shepherds and USDA Wildlife Services (USDA-WS) officials. Data was collected on cause of death for every identified sheep carcass. Information on LGD behavior was collected from shepherds. Location information for LGDs and sheep were collected via GPS collars and tags. Wolf locations were collected by project staff through triangulation of VHF signals from collared wolves and data sharing with MT-FWP officials. Grizzly bear locations were also obtained through opportunistic VHF detection. Grizzly bear locations collected by MT-FWP officials are pending. Location and occupancy data were also collected for LGDs, sheep, wolves, and grizzly bears via remote cameras. Remote camera data are currently being processed.

Five of the new kangal-breed LGDs had to be removed from the study during the 2013 season. Although there were a number of reasons for LGD removal, generally animals were removed because of failure to bond with the sheep. All of the removed animals were sourced from breeders who do not cater to the livestock industry. In the future, all new LGDs will be sourced

from reputable sources in their countries of origin and reputable breeders of guard animals in the United States.

Some of the new LGDs deterred large predators from attacking sheep. For example, at the Rockport colony near Pendroy, MT, where despite a sustained presence of grizzly bears very near their sheep barn, no sheep were lost to grizzly bears. Further, members of the Rockport colony claim that the three Kangal-breed LGDs placed there actively chase off grizzly bears, although no direct interactions have been documented. Considering the large number of lambs killed by grizzly bears at the Rockport colony in 2012, these observations are encouraging. In the 2014 field season at least two new Montana sheep producers will be included in the project in addition to four sheep producers in Idaho. More kangal-breed LGDs are being imported from Turkey to place with these producers as well as karakachan-breed LGDs from Bulgaria and transmontano-breed LGDs from Portugal. Field procedures and methodologies utilized in the 2013 field season will be carried forward in the 2014 field season. Additionally, project staff will begin explicit testing of LGD behavior on summer grazing allotments and human surveys to poll attitudes and perceptions of LGDs will be distributed. A field technician will be hired to collect data, monitor project operations, and coordinate with producers, MT-FWP, and USDA-WS in Montana. Daniel Kinka (PhD student/technician, USU) will be based in Idaho working with new producers, Idaho Fish and Game, and USDA-WS.

LGD collar frequencies for the 2014 field season will be provided to state and federal wildlife managers in Spring before LGDs go to summer grazing allotments. Brief project updates will be sent to state and federal wildlife officials involved in the study every 2-4 weeks during the 2014 field season. Please contact Julie Young at julie.k.young@aphis.usda.gov about receiving these updates.

Project Statistics (June 1 – November 15, 2013)
Number of LGDs monitored: 15
Number of sheep bands monitored: 5
Total number of sheep monitored: 5,629
Confirmed predator kills: 25
Confirmed mortality (non-predator): 5
Unaccounted for: 97
Number of remote camera pictures (unsorted): 87,086
Number of LGD locations (GPS): 6,519
Number of sheep herd locations (GPS): 580
Number of wolf locations (GPS/VHF): 15
Number of grizzly bear locations (GPS/VHF; pending MT-FWP data): 2

5.) Blackfoot Range Rider Program Update

Investigators: Seth M. Wilson, Liz Bradley, and Eric Graham

Collaborators: Blackfoot Challenge; People and Carnivores; Blackfoot area ranchers, landowners and managers; Montana Fish, Wildlife & Parks; U.S. Fish and Wildlife Service;

U.S. Forest Service; Bureau of Land Management; Montana Department of Natural Resources and Conservation; The Nature Conservancy, and The University of Montana.

The Blackfoot Challenge has been actively working to reduce the risk of livestock losses to wolves in the Blackfoot watershed since 2007. In addition to livestock carcass removal and electric fencing of calving areas, the Blackfoot Challenge has hired several seasonal range riders to help monitor wolf and livestock activity and to provide non-lethal tools to help reduce the potential for livestock depredations by wolves. These efforts have been carried out in close partnership with Fish, Wildlife and Parks.

The 2014 range rider season in the Blackfoot watershed focused on continuing to increase human presence around livestock herds that were adjacent to concentrations of wolf activity. Eric Graham was hired as the full-time range rider for the 2014 field season, while Molly Parks worked part-time and Ty Pocha was hired as an assistant range rider. Several livestock producers also devoted considerable time and effort toward increasing herd monitoring efforts on grazing allotments in the valley. This was the sixth official year of livestock and wolf monitoring efforts carried out by the Blackfoot Challenge and partners.

Increased livestock monitoring efforts in 2014 helped producers track overall herd health, behavior, and use of grazing allotments. Range riders regularly communicated with producers about the status of their herds and any concerns about cattle. Wolf monitoring efforts focused mainly on the Arrastra Creek, Morrell Mountain, Game Range area, Humbug, and Union Peak packs whose territories overlap extensively with summer livestock grazing areas. There very little activity observed on the Blackfoot Community Conservation Area, a former territory of the Ovando Mtn. pack, that are no longer in existence.

2014 Field Season Statistics:

- Completed 6 month field season monitoring livestock and wolves.
- Monitored 650-800 cow/calf pairs per week across 45,000 acres.
- Herd health and behavior were monitored and any issues were reported to producers.
- Range riders and cooperating producers logged over 2300 hours of livestock monitoring.
- Radio telemetry monitoring of four wolf packs documented presence of wolves regularly in the vicinity of livestock during the grazing season.
- Eleven wolf packs confirmed in the watershed.
- One confirmed livestock loss, 1 probable cow injured during the 2014 season.
- Three wolves removed for livestock depredations during 2014.

Social Tolerance / Communication Statistics:

- Worked to maintain trust and credibility with over a dozen local landowners and livestock producers whose herds were at greatest risk.
- Maintained regular communication with an additional 40-50 landowners and producers who were at moderate risk of depredations by wolves.
- Maintained regular communication through list-serve and BC website with 150 people.
- Produced 8 *Wolf Activity Reports* for community and project partners.
- Produced 1 *Blackfoot Range Rider End-of-Year Final Report (in-progress)*
- Maintained weekly contact with Fish, Wildlife and Parks and partners.

- Made 4 public presentations on wolf issues to approximately 200 people.
- Made 1 public presentation to 80 local school children
- Co-organized and facilitated 1 “Range Rider Rendezvous” in Republic, WA-2014

Timeline of wolf abundance and livestock interactions for the Blackfoot watershed:

2008:
- 3 confirmed wolf packs (est. 18 wolves)
- 4 confirmed calf losses
- 4 wolves removed

2009:
- 5 confirmed wolf packs (est. 24 wolves including pups)
- 2 confirmed calf losses
- 2 wolves removed

2010:
- 7 confirmed wolf packs (est. 45 wolves including pups)
- 4 confirmed livestock losses (2 calves, 1 cow, 1 horse)
- 8 wolves removed

2011:
- 10 confirmed wolf packs (est. 55 animals including pups)
- 3 confirmed livestock losses (2 calves and 1 ewe)
- No wolves removed by W.S.
- 2 wolves killed illegally

2012:
- 12 confirmed wolf packs (est. 52 animals including pups)
- 5 confirmed livestock losses (5 calves)
- 5 wolves removed by W.S.

2013:
- 13 confirmed wolf packs (est. 54 animals including pups)
- Zero confirmed livestock losses
- Two probable livestock losses to wolves
- Zero removed by W.S.

2014:
- 11 confirmed wolf packs (est. 48 animals including pups)
- 1 confirmed livestock losses (1 calf)
- 1 probable injured cow
- 2 wolves removed by W.S., 1 by public (Defense of property)

Discussion: The use of intensive herd monitoring or range riding is an important tool that may be helping to decrease the risk of livestock depredation by wolves in the project area. Regular monitoring of wolves and extensive communication networks that have been developed in the project area with the help of ranchers, residents, and our agency partners has been of great benefit. Cultivating trust within the ranching community is essential for documenting actual estimated wolf numbers/packs, understanding wolf pack behavior, and ultimately for developing the willingness by landowners to engage in proactive efforts that reduce livestock depredation risk to both grizzly bears and wolves.

We are hopeful that the combination of livestock carcass removal, electric fences that serve as safe havens for livestock from both bears and wolves, and our range rider project are having a cumulative, positive effect that helps people and wolves coexist in an agricultural landscape. As we look ahead to the 2015 field season, we are pleased to note that the range rider position is now a fulltime position with the Blackfoot Challenge.

We are hopeful that the combination of livestock carcass removal, electric fences that serve as safe havens for livestock from both bears and wolves, and our range rider project are having a cumulative, positive effect that helps people and wolves coexist in an agricultural landscape.

6.) Improving estimation of wolf recruitment and abundance, and development of an Adaptive Harvest Program for wolves in Montana.

Graduate Students: Sarah Sells and Allison Keever, Montana Cooperative Wildlife Research Unit, University of Montana, Missoula MT

This project will provide biological insights to enhance conservation and management of wolves in Montana, as well as population monitoring and modeling tools to monitor and forecast the effects of management actions (public harvest seasons and depredation response protocols) on wolf population dynamics and growth. This project is aimed at finalizing the wolf patch-occupancy-monitoring (POM) framework, building directly from previous research and efforts.

The objectives of this project are as follows.

1. Improve estimation of recruitment given the scarcity of information on breeding pairs.
2. Improve and maintain calibration of wolf abundance estimates generated through POM.
3. Develop a framework for dynamic, adaptive harvest management based on achievement of objectives 1 and 2.
4. Design a targeted monitoring program for wolves that will provide the information needed to ensure robust estimates and reduce uncertainty in the adaptive harvest management paradigm over time.

In 2014, funding for the project was secured from the Pittman-Robertson program, a contract was established with the Montana Cooperative Wildlife Research Unit at UM, and 2 PhD students, Sarah Sells and Ally Keever, were selected to start on this project in January 2015. Ten GPS collars were deployed in the summer and fall of 2014.

APPENDIX 4

MONTANA MINIMUM COUNTS BY AREA

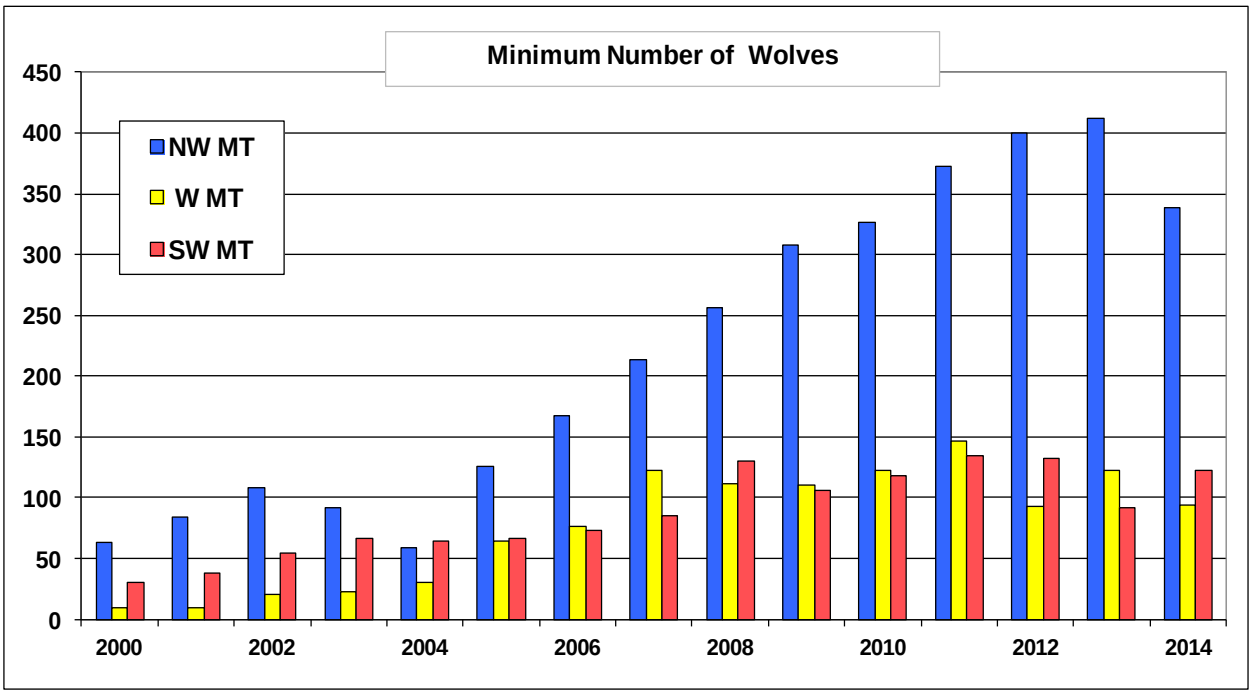

Figure 1. Minimum estimated number of wolves in Montana by recovery area, 2000-2014.

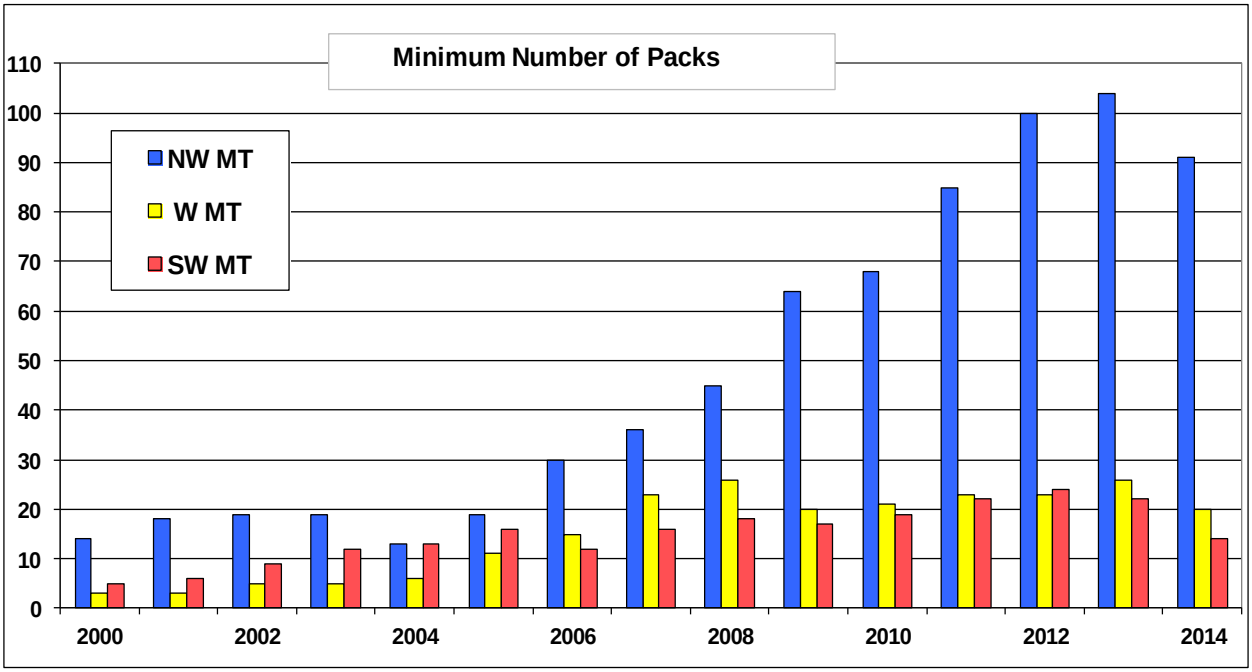

Figure 2. Minimum estimated number of packs in Montana by recovery area, 2000–2014.

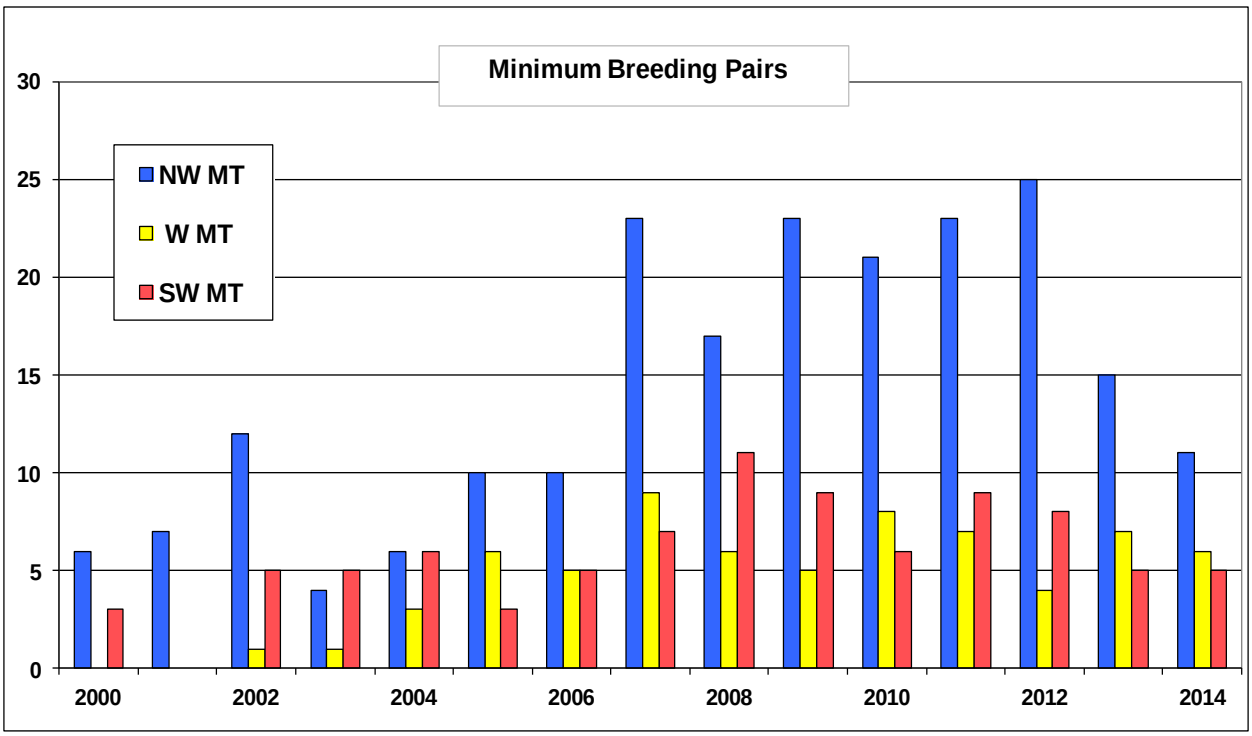

Figure 3. Minimum estimated number of breeding pairs in Montana by recovery area, 2000–2014.

APPENDIX 5

NORTHERN ROCKIES WOLF PACK TABLES

Table 1a. Wolf Packs and Population Data for the Northwest Montana Recovery Area, 2014.

Table 1b. Wolf Packs and Population Data for the Greater Yellowstone Recovery Area, 2014.

Table 1c. Wolf Packs and Population Data for the Central Idaho Recovery Area and Montana Statewide Totals, 2014.

Table 1a: Wolf Packs and Population Data for Montana's Portion of the Northwest Montana Recovery Area, 2014.

REF #	WOLF PACK[1]	RECOV AREA	STATE	MIN. ESTIMATED PACK SIZE DEC 2014	DOCUMENTED CAUSE OF MORTALITIES					KNOWN		CONFIRMED LOSSES[6]			
					NATURAL	HUMAN[2]	UNKN[3]	HARVEST[8]	CONTROL[5]	DISPERSED	MISSING[4]	CATTLE	SHEEP	DOGS	OTHER
1	Akokala	NWMT	MT	4											
2	Arrastra Creek	NWMT	MT	6		1		1	3			1			
3	Ashley	NWMT	MT	2							1				
4	Baptiste	NWMT	MT	4											
5	Bearfite	NWMT	MT	2				1							
6	Belmont	NWMT	MT	3											
7	Bennie	NWMT	MT	6				1							
8	Bisson (CSKT)	NWMT	MT	2											
9	Blowout Mountain	NWMT	MT	8				2				1			
	~~Brimstone~~[7]	NWMT	MT	0		5									
10	Bugle Mountain	NWMT	MT	2											
11	Cabinet	NWMT	MT	2		1		7							
12	Cache Creek #	NWMT	MT	7				2							
13	Candy Mountain	NWMT	MT	2				10							
14	Cataract	NWMT	MT	2				1							
15	Cedar	NWMT	MT	2				1							
16	Chamberlain	NWMT	MT	5				1							
17	Chief Mtn (BFN)	NWMT	MT	10											
18	Chippy	NWMT	MT	2											
19	Cilly	NWMT	MT	2											
20	Condon	NWMT	MT	2				4							
21	Conger Point	NWMT	MT	4				1							
22	Corona	NWMT	MT	3				5							
	~~Cottonwood (CSKT)~~[7]	NWMT	MT												
23	Crown Mtn	NWMT	MT	7		2		5	1						
	~~Dalton Mountain~~[7]	NWMT	MT	0											
24	DeBorgia #	NWMT	MT	4											
	~~Deer Creek~~[7]	NWMT	MT				1								
	~~Dirtyface~~[7]	NWMT	MT												
25	Dog Gun (BFN)	NWMT	MT	4				2							

Continued.

Table 1a: Wolf Packs and Population Data for Montana's Portion of the Northwest Montana Recovery Area, 2014. (Continued)

REF #	WOLF PACK[1]	RECOV AREA	STATE	MIN. ESTIMATED PACK SIZE DEC 2014	DOCUMENTED CAUSE OF MORTALITIES					KNOWN		CONFIRMED LOSSES[6]			
					NATURAL	HUMAN[2]	UNKN[3]	HARVEST[8]	CONTROL[5]	DISPERSED	MISSING[4]	CATTLE	SHEEP	DOGS	OTHER
	~~Dry Forks (CSKT)~~[7]	NWMT	MT					1						1	
26	Dutch	NWMT	MT	3											
27	Echo	NWMT	MT	2				1							
28	Evaro	NWMT	MT	2				1							
	~~Ferry Basin (CSKT)~~[7]	NWMT	MT												
29	Firefighter	NWMT	MT	2											
30	Flathead Alps	NWMT	MT	2											
31	Flesher Pass	NWMT	MT	4								1			
32	Garden (CSKT)	NWMT	MT	4				1	3			2			
	~~Good~~[7]	NWMT	MT												
33	Great Bear	NWMT	MT	2											
34	Great Northern	NWMT	MT	2				1							
	~~Halfmoon~~[7]	NWMT	MT					1							
35	Humbug	NWMT	MT	2											
36	Inez	NWMT	MT	5				2							
37	Kerr	NWMT	MT	2				2	7		1				
	~~Keystone~~[7]	NWMT	MT												
38	Kintla	NWMT	MT	6			1								
39	Kootenai North	NWMT	MT	4				1							
40	Kootenai South	NWMT	MT	2				2							
41	Ksanka	NWMT	MT	2				10							
	~~Lamoose~~[7]	NWMT	MT												
42	Landers Fork	NWMT	MT	6											
	~~Leota~~[7]	NWMT	MT												
43	Livermore (BFN)	NWMT	MT	3					8			6			
44	Looking Glass (BFN)	NWMT	MT	3											1
45	Lost #	NWMT	MT	2				1							
46	Lost Girl	NWMT	MT	2				1							
47	Lost Peak #	NWMT	MT	6				1							
48	Lost Soul	NWMT	MT	7											
49	Lydia	NWMT	MT	5											

Continued.

Table 1a: Wolf Packs and Population Data for Montana's Portion of the Northwest Montana Recovery Area, 2014. (Continued)

REF #	WOLF PACK[1]	RECOV AREA	STATE	MIN. ESTIMATED PACK SIZE DEC 2014	DOCUMENTED CAUSE OF MORTALITIES					KNOWN DISPERSED	MISSING[4]	CONFIRMED LOSSES[6]			
					NATURAL	HUMAN[2]	UNKN[3]	HARVEST[8]	CONTROL[5]			CATTLE	SHEEP	DOGS	OTHER
50	Marias	NWMT	MT	2				1							
51	McDonald	NWMT	MT	2											
	~~McGinnis~~[7]	NWMT	MT												
52	McKay	NWMT	MT	2				2							
53	Mineral Mountain	NWMT	MT	2		1		3							
54	Moore	NWMT	MT	2				2							
55	Morrell Mountain	NWMT	MT	2											
	~~Mullan~~[7]	NWMT	MT												
56	Murphy Lake	NWMT	MT	4				4							
	~~Nasu'kin~~[7]	NWMT	MT												
57	Ninemile	NWMT	MT	6				1	4		1				
58	No	NWMT	MT	2				1							
59	Noisy	NWMT	MT	3				3							
60	Nyack	NWMT	MT	2											
61	O'Brien	NWMT	MT	2				1							
62	Olson Peak	NWMT	MT	4			1	4							
	~~Ophir Creek~~[7]	NWMT	MT	0				1	3			1			
	~~Ovando Mountain~~[7]	NWMT	MT	0											
63	Petty Creek	NWMT	MT	3		3	1	1							
64	Pierce	NWMT	MT	2				2							
65	Pistol Creek (CSKT)	NWMT	MT	8											
66	Preacher #	NWMT	MT	2		1									
67	Pretty Prairie	NWMT	MT	10											
68	Quartz Creek	NWMT	MT	3		1	1	2							
69	Quintonkon	NWMT	MT	2				1							
70	Red Shale	NWMT	MT	10				3							
71	Satire	NWMT	MT	4		2		4	3			2			
72	Savenac	NWMT	MT	10											
73	Silcox	NWMT	MT	2				1							
74	Silver Lake #	NWMT	MT	12											

Continued.

Table 1a: Wolf Packs and Population Data for Montana's Portion of the Northwest Montana Recovery Area, 2014. (Completed)

REF #	WOLF PACK[1]	RECOV AREA	STATE	MIN. ESTIMATED PACK SIZE DEC 2014	DOCUMENTED CAUSE OF MORTALITIES					KNOWN		CONFIRMED LOSSES[6]			
					NATURAL	HUMAN[2]	UNKN[3]	HARVEST[8]	CONTROL[5]	DISPERSED	MISSING[4]	CATTLE	SHEEP	DOGS	OTHER
75	Smoky	NWMT	MT	4				1							
76	Solomon Mountain #	NWMT	MT	2				1							
77	Spotted Bear	NWMT	MT	2				2							
78	Sugarloaf	NWMT	MT	8											
79	Sundance	NWMT	MT	2				1							
80	Sunrise Mountain	NWMT	MT	2			1	2							
81	Tallulah	NWMT	MT	2											
82	Telephone Butte	NWMT	MT	5				1							
83	Teton	NWMT	MT	6				5							
84	Tom Meier	NWMT	MT	3				3							
85	Twilight #	NWMT	MT	2											
86	Union Peak	NWMT	MT	2											
87	Valley Creek (CSKT)	NWMT	MT	2				1							
88	Vermillion	NWMT	MT	2											
89	Weigel	NWMT	MT	3				3							
90	Wiggletail #	NWMT	MT	2				1							
91	Wolf Prairie	NWMT	MT	2				1							
	Misc/Lone	NWMT	MT	7		5		11				1			
MT in NWMT (Table 1a)		NWMT	MT	338	0	22	6	140	32	0	3	15	0	1	1
ID in NWNMT (Table 3b)		NWMT	ID	0	0	0	0	0	0	0	0	0	0	0	0
NWMT RECOVERY AREA		NWMT	MT/ID	338	0	22	6	140	32	0	3	15	0	1	1

1 Underlined packs are counted as breeding pairs toward recovery goals. CSKT = Flathead Indian Reservation; BFN = Blackfeet Indian Reservation.

2 Excludes wolves killed in control actions to address livestock depredation and lawful public harvest.

3 Does not include pups that disappeared before winter.

4 Collared wolves that became missing in 2014.

5 Agency lethal control whether under state or federal regulations. Includes wolves killed by private citizens to defend livestock or under terms of a kill permit.

6 Includes only domestic animals confirmed killed by wolves.

7 Pack did not exist on Dec. 31 2014 and is not displayed on the map.

8 Number legally harvested by humans in 2014.

Border pack shared with the State of Idaho; dens in Montana.

Table 1b: Wolf Packs and Population Data for Montana's Portion of the Greater Yellowstone Recovery Area, 2014.

REF #	WOLF PACK[1]	RECOV AREA	STATE	MIN. ESTIMATED PACK SIZE DEC 2014	DOCUMENTED MORTALITIES					KNOWN DISPERSED	MISSING[4]	CONFIRMED LOSSES[6]			
					NATURAL	HUMAN[2]	UNKN[3]	HARVEST[8]	CONTROL[5]			CATTLE	SHEEP	DOGS	OTHER
	~~Avalanche~~[7]	GYA	MT	0											
92	Baker Mountain	GYA	MT	5		1		7				1			
93	Beartrap	GYA	MT	15				2		1					
94	Brackett Creek	GYA	MT	2				1							
95	Buffalo Fork Pack	GYA	MT	2											
96	Carmichael	GYA	MT	3		1		1							
97	Cedar Creek	GYA	MT	6				1							
98	Cougar 2*	GYA	MT	2				1							
	~~Davey Butte~~[7]	GYA	MT	0											
	~~Elephant Rock~~[7]	GYA	MT	0											
99	Elkhorn	GYA	MT	4					1						
100	Fridley	GYA	MT	3											
101	Hayden*	GYA	MT	7				2							
102	Hogback	GYA	MT	8											
	~~Horsethief Mountain~~[7]	GYA	MT	0											
	~~Jack Creek~~[7]	GYA	MT	0											
103	Lebo Peak	GYA	MT	2											
104	Meadow Creek	GYA	MT	5				1							
105	Mill Creek	GYA	MT	2											
106	Price Creek	GYA	MT	6				2	1				4		
107	Romey Lake	GYA	MT	8				2	1			1			
108	Rosebud	GYA	MT	3		2		1				1			
109	Shinglemill	GYA	MT	9											
110	Slip n' Slide	GYA	MT	6				1							
111	Steamboat Peak	GYA	MT	8				1	1			1			
112	Tanner Pass	GYA	MT	5				1							
113	Toadflax	GYA	MT	7		2		4							
	~~West Fork~~[7]	GYA	MT	0					6			5			

Continued.

Table 1b: Wolf Packs and Population Data for Montana's Portion of the Greater Yellowstone Recovery Area, 2014. (Completed)

REF #	WOLF PACK[1]	RECOV AREA	STATE	MIN. ESTIMATED PACK SIZE DEC 2014	DOCUMENTED MORTALITIES					KNOWN DISPERSED	MISSING[4]	CONFIRMED LOSSES[6]			
					NATURAL	HUMAN[2]	UNKN[3]	HARVEST[8]	CONTROL[5]			CATTLE	SHEEP	DOGS	OTHER
114	Wilson Creek	GYA	MT	3				1							
	Misc/Lone	GYA	MT	1	1	1		14							
MT in GYA (Table 1b)		GYA	MT	122	1	7	0	43	10	1	0	9	4	0	0

1 Underlined packs are counted as breeding pairs toward recovery goals.

2 Excludes wolves killed in control actions.

3 Does not include pups that disappeared before winter.

4 Collared wolves that became missing in 2014.

5 Agency lethal control whether under state or federal regulations. Includes wolves killed by private citizens to defend livestock or under terms of a kill permit.

6 Includes only domestic animals confirmed killed by wolves.

7 Pack did not exist on December 31, 2014 and is not displayed on the map.

8 Number legally harvested by humans in 2014.

* Border pack shared with Yellowstone National Park; more time in Montana.

Table 1c: Wolf Packs and Population Data for Montana's Portion of the Central Idaho Recovery Area and Montana Statewide Totals, 2014.

REF. #	WOLF PACK[1]	RECOV AREA	STATE	MIN. ESTIMATED PACK SIZE DEC 2014	DOCUMENTED MORTALITIES					KNOWN	MISSING[4]	CONFIRMED LOSSES[6]			
					NATURAL	HUMAN[2]	UNKN[3]	HARVEST[8]	CONTROL[5]	DISPERSED		CATTLE	SHEEP	DOGS	OTHER
115	Alta #	CID	MT	2											
116	Ambrose	CID	MT	4				1							
117	Anaconda	CID	MT	8				3							
118	Black Pine	CID	MT	2											
119	Bloody Dick #	CID	MT	5				2				3			
	~~Burnt Fork~~[7]	CID	MT	0											
120	Divide Creek	CID	MT	9											
121	East Fork Rock Creek	CID	MT	2											
122	Flint	CID	MT	4				1	3			1			
123	Foolhen	CID	MT	2											
124	Gash Creek #	CID	MT	4				2							
125	Gird Point	CID	MT	3											
126	Jeff Davis #	CID	MT	5		1			3						
	~~Lolo~~[7]	CID	MT	0											
	~~Mt. Haggin~~[7]	CID	MT	0											
127	One Horse	CID	MT	6				2	2		1	1			
128	Overwhich #	CID	MT	6											
129	Pyramid #	CID	MT	8				2							
	~~Ross' Fork~~[7]	CID	MT	0				3							
130	Sliderock Mtn	CID	MT	4				1							
131	Sula #	CID	MT	4											
132	Tepee Point	CID	MT	7				1							
	~~Trail Creek~~ #[7]	CID	MT	0				1							
133	Trapper Peak	CID	MT	3					1			1			

Continued.

Table 1c: Wolf Packs and Population Data for Montana's Portion of the Central Idaho Recovery Area and Montana Statewide Totals, 2014. (Completed)

REF. #	WOLF PACK[1]	RECOV AREA	STATE	MIN. ESTIMATED PACK SIZE DEC 2014	DOCUMENTED MORTALITIES					KNOWN DISPERSED	MISSING[4]	CONFIRMED LOSSES[6]			
					NATURAL	HUMAN[2]	UNKN[3]	HARVEST[8]	CONTROL[5]			CATTLE	SHEEP	DOGS	OTHER
134	Watchtower #	CID	MT	2											
	Misc/Lone	CID	MT	4		1		11	6			7	4		
	MT Total in CID	CID	MT	94	0	2	0	30	15	0	1	13	4	0	0
	MT in NWMT total (Table 1a)	NWMT	MT	338	0	22	6	140	32	0	3	15	0	1	1
	MT in GYA total (Table 1b)	GYA	MT	122	1	7	0	43	10	1	0	9	4	0	0
	MT in CID total (Table 1c)	CID	MT	94	0	2	0	30	15	0	1	13	4	0	0
	MT STATE TOTAL		**MT**	**554**	**1**	**31**	**6**	**213**	**57**	**1**	**4**	**37**	**8**	**1**	**1**

1 Underlined packs are counted as breeding pairs toward recovery goals.

2 Excludes wolves killed in control actions.

3 Does not include pups that disappeared before winter.

4 Collared wolves became missing in 2014.

5 Includes agency lethal control and take by private citizens under state regulations.

6 Includes only domestic animals confirmed killed by wolves.

7 Pack did not exist on December 31, 2014 and is not displayed on the map.

8 Number legally harvested by humans in 2014.

Border pack shared with State of Idaho; dens in Montana and majority of time in Montana.