This report presents information on the status, distribution, and management of wolves in the State of Montana, from January 1, 2025, to December 31, 2025.

This report is also available at: https://fwp.mt.gov/conservation/wildlife-management/wolf

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Montana Gray Wolf Program
2025 Annual Report

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EXECUTIVE SUMMARY

Though extirpated from Montana in the early 1900s, wolves are now fully recovered in Montana. Wolf recovery efforts began in the early 1980s, and by 2002, the northern Rockies wolf population met the biological recovery criteria of 30 breeding pairs for 3 consecutive years in the Northern Rocky Mountains (NRM) of Montana, Idaho and Wyoming. In preparation for delisting, Montana developed its initial Wolf Conservation and Management Plan based on the work of a citizen's advisory council, which was approved by the United States Fish and Wildlife Service (USFWS) in 2004. Delisting was not immediate, however, and the wolf population in the NRM tripled between the time recovery goals were met and when wolves were ultimately delisted by congressional action in 2011. At present, Montana Fish, Wildlife and Parks (FWP) implements wolf management using a combination of sportsman license dollars and federal Pittman-Robertson funds (excise tax on firearms, ammunition, and hunting equipment) to monitor the wolf population, regulate harvest, collar packs in livestock areas, coordinate and authorize research, and direct problem wolf control under certain circumstances.

The primary means of monitoring wolf distribution, numbers, and trend in Montana is the integrated Patch Occupancy Model, or "iPOM." iPOM uses annual hunter effort surveys, known wolf locations, habitat covariates, and estimates of wolf territory size and pack size to estimate wolf distribution and population size across the state. From early stages of development, iPOM has been presented as an adaptive modeling framework intended to evolve as new data and analytical methods become available. Each sub-model and component in iPOM has recently been revisited using updated data, revised methods, or both. (See appendix 6 for a high-level summary of these updates). Therefore, we report 2 sets of estimates for 2025. The 2025 statewide wolf estimate using the original iPOM method (hereafter referred to as iPOM 1.0) was 1094 wolves (95% C.I. = 991 – 1,211; Fig. 1), while the preliminary updated estimate using the iPOM 2.0 is 725 wolves (95% CL 618-836, Fig. 1)

Wolf hunting was recommended as a management tool in the 2004 Montana Wolf Conservation and Management Plan, and wolf harvest seasons have been implemented each year since delisting. Calendar year 2025 included parts of two hunting-trapping seasons for wolves. During calendar year 2025, 165 wolves were harvested during the spring, and 99 wolves were harvested during the fall for a total of 264. Sales of license year 2025 (2025-2026 season) wolf hunting licenses generated $303,870.00 for wolf monitoring and management in Montana.

Wildlife Services (WS) confirmed the loss of 68 livestock to wolves during 2025. This total includes 44 cattle, 18 sheep, and 5 livestock guard dogs and one additional livestock dog that were killed by wolves. This total was similar to the 62 confirmed livestock losses in 2024, and lower than the average annual confirmed losses observed in the last decade. During 2025 the Montana Livestock Loss Board paid $92,917 for livestock that were confirmed by WS as killed by wolves or probable wolf kills. Forty-three wolves were killed in response to depredation or to reduce the potential for further depredation. Of the 43 wolves, 37 were killed by WS and 6 were lawfully taken by private citizens. FWP's Wolf Specialists radio-collared 23 wolves during 2025 to meet the legislative requirement for collaring livestock packs and to aid in population monitoring and research efforts.

Montana's wolf population grew steadily from the early 1980s when there were less than 10 in the state. Wolf numbers peaked around 2011, with an observed decline since 2013 (Fig. 1). The slow reduction of population size corresponds with the onset and gradual liberalization of wolf hunting and trapping seasons, whereas reduced livestock depredation in recent years is likely related to more

aggressive depredation control actions (DeCesare et al. 2018). Wolf license sales have generated nearly $6 million for wolf management and monitoring since 2009.

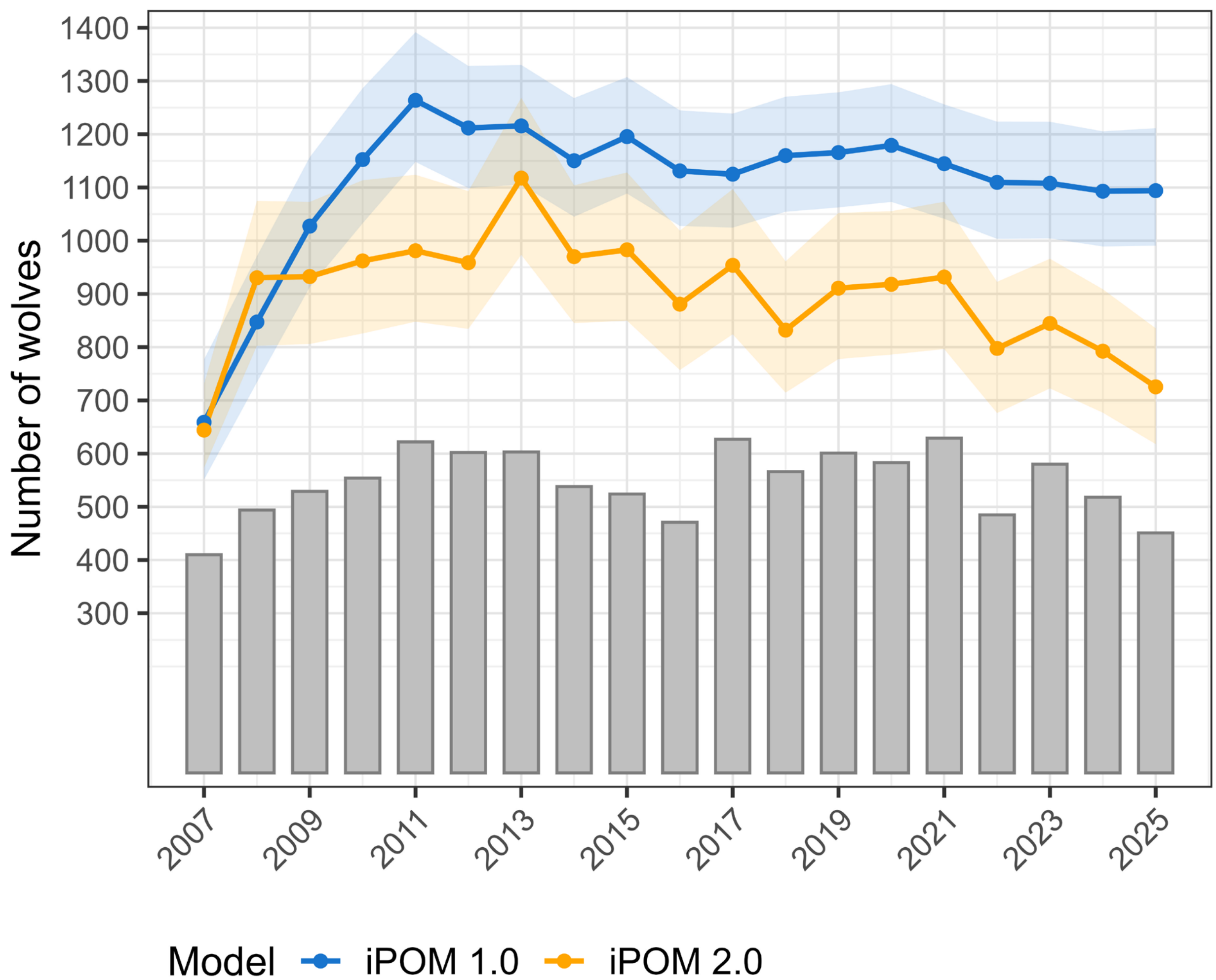

Figure 1. Estimated number of wolves in Montana (including 95% uncertainty intervals) from integrated Patch Occupancy Modeling (iPOM 1.0) and updated iPOM 2.0, with verified minimum number of wolves residing in Montana 2007 – 2025.

1. BACKGROUND

Wolf recovery in Montana began in the early 1980s. Wolves increased in number and distribution because of natural emigration from Canada and successful federal and tribal efforts that reintroduced wolves into Yellowstone National Park and the wilderness areas of central Idaho. When the federal wolf recovery goal of 30 breeding pairs for 3 consecutive years in Montana, Idaho and Wyoming was met in 2002, U.S. Fish and Wildlife Service (USFWS) declared wolves had reached biological recovery. During 2002 there were a minimum of 663 wolves and 43 breeding pairs in the Northern Rocky Mountains (NRM).

To prepare for delisting, the Montana Gray Wolf Conservation and Management Plan was developed, achieving USFWS approval in 2004. However, delisting was not immediate. In April 2011, nine years after meeting recovery criteria, Congress directed the Secretary of the Interior to reissue the final delisting rule for NRM wolves. By this point, the minimum wolf population In the NRM consisted of more than 1,600 wolves and 100 breeding pairs. On May 5, 2011, the USFWS published the final delisting rule designating wolves throughout the Distinct Population Segment (DPS), except Wyoming, as a delisted species.

Beginning with delisting in May 2011, the wolf was reclassified as a Species in Need of Management in Montana. Montana's laws, administrative rules, commission regulations, and state wolf plan replaced the federal framework. Because much has changed in the 20 years since the initial wolf plan was adopted, FWP recently drafted a new wolf plan. Adopted in March 2025, the new wolf plan incorporates updates in wolf-related research, more than 20 years of management experience, evolution in conflict management, new laws, social perspectives, and public input.

At present, Montana Fish, Wildlife and Parks (FWP) implements wolf management using a combination of sportsman license dollars and federal Pittman-Robertson funds (excise tax on firearms, ammunition, and hunting equipment) to monitor the wolf population, regulate hunter harvest, coordinate and authorize research, and address wolf-livestock conflicts. USDA Wildlife Services (WS) continues to investigate injured and dead livestock, and FWP works closely with them to resolve conflicts. While depredation response efforts are still a critical role of WS, their nonlethal initiative also delivers proactive wolf-livestock conflict prevention tools to livestock producers throughout Montana. Montana's Livestock Loss Board compensates producers for losses to wolves and other large carnivores and further provides grant funding to support conflict prevention tools where carnivore-livestock conflicts occur.

Montana wolf conservation and management have transitioned to a more fully integrated program since delisting. With the wolf population level securely above requirements for over a decade, FWP continues to adapt the wolf program to match resources and needs. For years, when the population was small and wolves were listed, a "wolf weekly" report was issued, detailing all depredations, collaring, control and known mortalities. That level of detail and its associated expense is no longer warranted, and the information is now reported annually. This allows limited personnel time and conservation dollars to be allocated more effectively.

Population monitoring techniques have also changed. Wolf packs were intensively monitored year-round beginning with their return to the northwestern part of Montana in the 1980s. Objectives for monitoring during the period of recovery were driven by the USFWS's recovery criteria – 30 breeding pairs for 3 consecutive years in Montana, Idaho, and Wyoming. Similar metrics of population status were used from the time recovery criteria were met in 2002, through delisting in 2011, and for the 5 years when the USFWS retained oversight after delisting. These population monitoring criteria and methods were appropriate and achievable when the wolf population was small and recovering. For instance, in 1995, when wolves were reintroduced into Yellowstone National Park and central Idaho, the end-of-year count for wolves residing in Montana was 66. 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. However, in later years, the minimum count of wolves approached or exceeded 500 individuals distributed across more than 25,000 square miles of mostly rugged and remote terrain in western Montana. Therefore, the ability to count every pack, every wolf, and every breeding pair has become expensive and unrealistic. Consequently, FWP has moved to more cost-effective methods for monitoring wolves. These methods can be more accurately described as population estimates that account for uncertainty (confidence intervals), as opposed to a minimum count where the end result, at this time when populations are large, reflects total effort (and dollars spent) more than population numbers.

FWP first began considering alternative approaches to monitoring the wolf population in 2006 through a collaborative effort with the University of Montana Cooperative Wildlife Research Unit. 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 – the "Patch occupancy model" (POM; Rich et al. 2013a) and more recently, the "integrated Patch Occupancy Model" (iPOM; Sells et al. 2022).

While minimum counts and pack tables were reported through 2017, FWP stopped publishing this data starting in 2018 and instead focused reporting on iPOM estimates for consistency with population monitoring techniques. However, pack tables including minimum counts were still developed each year with continued field monitoring efforts. Pack tables 2018 - 2023 can be found in Appendix 5 of the 2023 Annual Wolf Report. The 2024 pack table can be found in Appendix 5 of the 2024 Annual Wolf Report, and the 2025 pack table can be found in Appendix 5 of this report.

2. WOLF POPULATION MONITORING

2.1 Wolf Distribution and Numbers via Integrated Patch Occupancy Modeling

iPOM is used to estimate the distribution and number of wolves in Montana (Sells et al. 2020). Under iPOM, an occupancy model estimates the extent of wolf distribution in Montana, and a territory model predicts territory sizes; together, these models predict the number of packs in a given area (Fig. 2). A group size model predicts pack sizes. Total abundance estimates are derived by combining the estimated number of packs and pack sizes, while also accounting for lone and dispersing wolves.

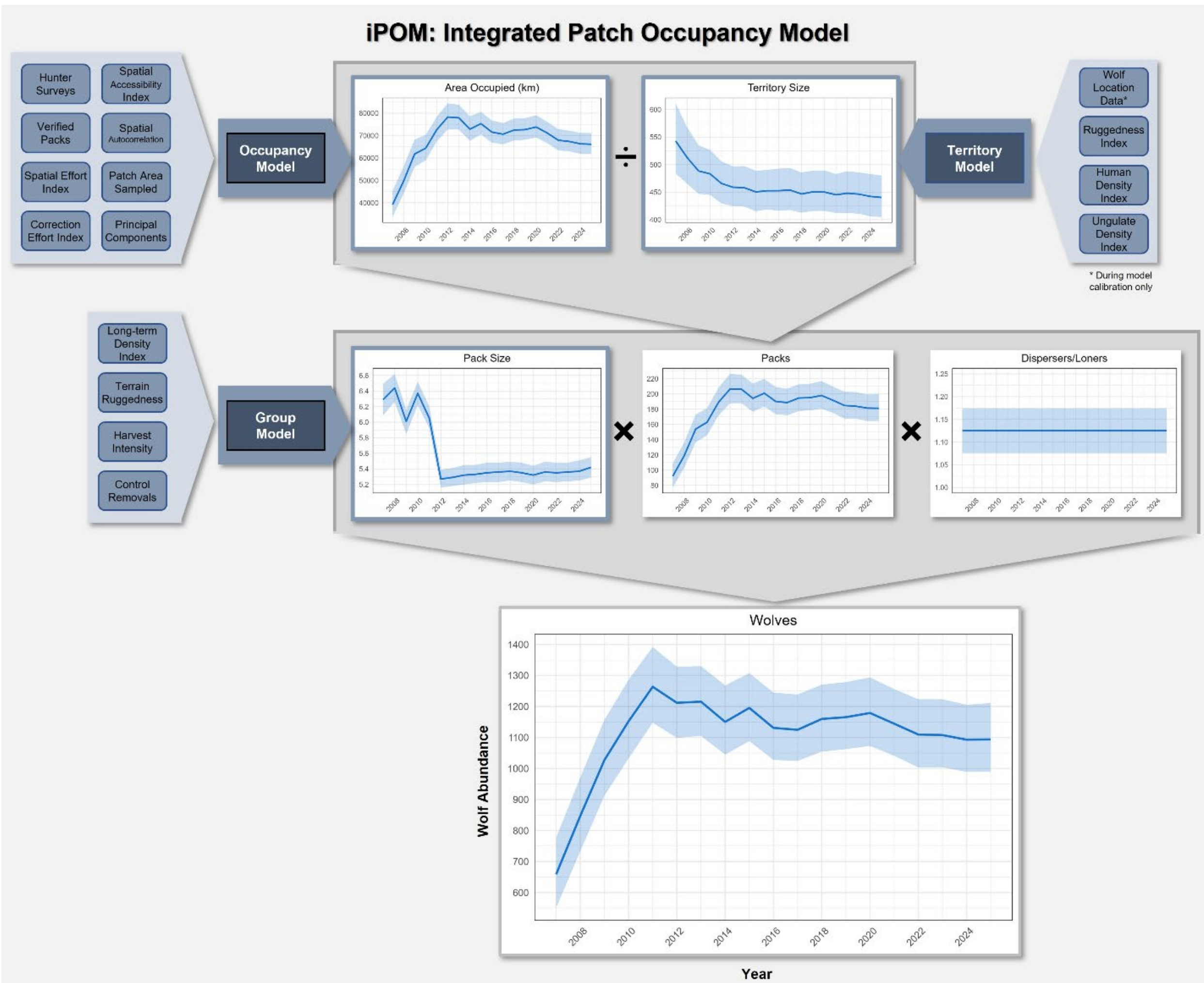

Figure 2. Schematic for method of estimating the area occupied by wolves, number of wolf packs and number of wolves in Montana, 2007 – 2025 using an integrated Patch Occupancy Model. Graphs show statewide estimates over time. Ribbons indicate 95% uncertainty intervals.

Integrated Patch Occupancy Modeling Methods

Occupancy Model

To predict where wolves occurred in Montana each year from 2007 – 2025, we fit a multi-season false-positives occupancy model in a Bayesian context (Bassing et al. 2019). This work built on an earlier occupancy model (Miller et al. 2013, Rich et al. 2013, Inman et al. 2020). Following those authors, we created an observation "iPOM grid" for Montana as 600 km^2 cells. We assigned locations of wolves in packs to grid cells, based on monitoring effort by FWP Wolf Specialists and wolf sightings reported by hunters each fall. Wolf Specialists monitored packs each year to verify presence using trail cameras, visual observations, and telemetry collars, and used these data to demarcate approximate territory centroids for packs. MFWP conducted annual Hunter Harvest Surveys of a random sample of 50,000 – 80,000 resident deer and elk hunters annually to obtain wolf sighting reports. Hunters spent 1.8 – 2.2 million hunter days each fall pursuing deer and elk (fwp.mt.gov), providing many observers across Montana. Hunters were queried about dates and locations of any sightings of groups of 2 – 25 wolves.

To develop encounter histories, we divided the 5-week general rifle season (occurring each year around late Oct through Nov or early Dec) into one-week encounter periods and mapped locations of pack centroids and hunter observations for each week. Based on past work (Miller et al. 2013, Rich et al. 2013, Inman et al. 2020), we included model covariates for detection as: 1) hunter days per km^2 in each hunting district (an index to spatial effort), 2) proportion of mapped wolf observations (a correction for effort, accounting for number of hunter observations with coordinates versus total reported, including any sightings with vague location descriptions), 3) densities of low-use forested and non-forested roads (indices of spatial accessibility), 4) a spatial autocovariate (proportion of neighboring cells with wolves seen out to a mean dispersal distance of 100 km), and 5) patch area sampled (because smaller cells on the border of Montana, parks, and tribal lands have less hunting activity and therefore less opportunity for hunters to see wolves). We also included cell size as a nuisance parameter to account for varying cell sizes. 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 (number of years with verified pack locations in the previous 5 years).

Using these pack locations and model covariates, we fit the multi-season false-positives occupancy model to estimate psi, the probability of occupancy (ψ). We used pack centroids to estimate probabilities of false positives, true positives, and false negatives (Miller et al. 2013). We estimated ψ for tribal lands and national parks, where no hunter survey data were available, via modeled covariates.

We used Markov chain Monte Carlo (MCMC; Brooks 2003) methods in a Bayesian framework to fit the occupancy model using program R 3.4.1 (R Core Team 2020) and package rjags (Plummer et al. 2019) that calls on program JAGS 4.2.0 (Plummer 2003). We ran 3 chains for 10,000 iterations, after an adaptation phase of 10,000 iterations and a burn-in of 10,000 iterations. We did not thin the MCMC chains.

Territory Model

We used a mechanistic territory model to predict territory size (Sells and Mitchell 2020 and Sells et al. 2020, 2021). The territory model was a spatially-explicit, agent-based model representing the hypothesis that wolves are adapted to select economical territories that maximize food benefits and minimize costs of travel, competition, and mortality risk. After calibrating the model using wolf location data collected from 2014 – 2018 (Sells et al. 2020), the model provided territory size predictions through simulations in NetLogo 6.1.1 (Wilensky 1999).

The model demonstrated the strong effect of competition on resulting space use (Sells and Mitchell 2020; Sells et al. 2020, 2021). Accordingly, we applied the model to predict territory sizes at a wide range of possible pack densities and resulting levels of competition. We used a density identifier model (Sells et al. 2020) to predict levels of competition in each area of Montana for each year. We then used the territory sizes predicted at the given level of competition as estimates of territory size in each area of the state.

Group Model

We used a recently developed group size model (Sells et al. 2020) to predict pack sizes in each 600 km^2 iPOM grid cell. The model was based on mechanisms hypothesized to influence wolf pack size and developed using 14 years of wolf pack data. The generalized linear mixed effects model included effects of pack density, terrain ruggedness, harvest intensity, and control removals. Pack density was the long-term (2005 – 2018) mean pack density in the iPOM grid cell, which served as an index to density trends (Sells et al. 2020). Ruggedness was terrain ruggedness in the iPOM grid cell. Harvest intensity was categorized as “none” when no harvest was allowed, “restricted” if 2009 and 2011 rules were followed (statewide harvest was limited by a quota, seasons were shorter, bag limits were low, and trapping was prohibited), and “liberal” if 2012 – 2025 rules were followed (statewide harvest quotas were removed, seasons were longer, bag limits were higher, and trapping was allowed; fwp.mt.gov). Control removals were reported numbers of wolves removed for depredations in the iPOM grid cell that year. Ecoregion defined in which ecoregion the iPOM grid cell fell (epa.gov). The unique identifier for the iPOM grid cell was included as a random effect to account for repeated observations among years. We applied the model to each iPOM grid cell, each year, to predict local pack size.

Model Integration

We estimated numbers of packs and wolves for each year, 2007 – 2025, by combining predictions from the 3 models (Fig. 2) using an integrated approach (Sells et al. 2022). We first calculated mean estimated occupancy ($\bar{\psi}$) across iPOM grid cells, then calculated area occupied ($area_{occupied}$) as:

$$area_{occupied} = \bar{\psi} \times \sum grid_{area}$$

where $\sum grid_{area}$ was the sum of grid cell areas. We calculated number of estimated packs as:

$$N_{packs} = area_{occupied} \div territory_{size}$$

where values for $territory_{size}$ were drawn with replacement for each iteration of the MCMC chain from the distribution of territory sizes predicted by the territory model at the specific grid cell. Values for $territory_{size}$ were therefore spatially explicit and biologically appropriate to local conditions each year and accounted for uncertainty. We then calculated number of wolves as:

$$N_{wolves} = N_{packs} \times pack_{size} \times lone_{rate}$$

where $lone_{rate}$ accounted for lone and dispersing wolves. For $pack_{size}$ we drew for each iteration of the MCMC chain a value from the distribution of group sizes predicted at the specific grid cell. This provided spatially explicit and biologically appropriate values for local conditions each year while incorporating model uncertainty about pack size. We modeled $lone_{rate}$ by drawing for each iteration of the MCMC chain values from a normal distribution assuming a mean of 1.125 and standard deviation of 0.025. This yielded a loner/disperser rate of 12.5% and incorporated variation and uncertainty around this rate, as 95% of values drawn were 7.6 – 17.4%. We selected these values based on studies documenting that 10 – 15% of wolf populations are comprised of lone or dispersing wolves (Fuller et al. 2003). This is consistent with Idaho's calculations for lone wolves (Holyan et al. 2013) and slightly more conservative than Minnesota's calculations, which add 15% (Erb et al. 2018).

To account for uncertainty and calculate credible intervals (CI's) for all parameters, we retained posterior estimates of 10,000 values for each and calculated the median value and 2.5% and 97.5% values (creating 95% CI's) for $area_{occupied}$, $territory_{size}$, $pack_{size}$, N_{packs}, and N_{wolves}. We calculated density of packs per 1,000 km^2, wolves per 1,000 km^2, and population growth (lambda, λ).

We repeated these calculations for FWP management regions by completing each step described above at each subsetted group of grid cells by region. Grid cells were categorized by the region in which the majority of their areas fell.

iPOM 2.0 Updates

A series of updates to iPOM (now identified as iPOM 2.0) have been in progress for several years and reflect the iterative nature of the scientific process and model development. When iPOM 1.0 was originally published, several model components were identified for future refinement, which reflects the expectation that data availability and model performance would continue to evolve over time (Sells et al. 2022*c*). Since then, additional updates became warranted as additional monitoring data and analytical methods became available. A few key iPOM updates are highlighted below, though they are more fully described in appendix 6. Remaining steps involve final model selection, peer review, and publication of the complete iPOM 2.0 framework.

- IPOM 1.0's occupancy model had remained largely unchanged since its original development more than a decade ago (Miller et al. 2013, Rich et al. 2013, Bradley et al. 2014). Advances in available data and analytical methods provided an opportunity to revisit the occupancy framework and evaluate additional model formulations.
- While iPOM 1.0 and 2.0 both use the same underlying mechanistic territory model, iPOM 2.0 updates how local density conditions are represented when selecting territory-size predictions.
- iPOM 2.0 incorporates a broader pack-size dataset. While iPOM 1.0 used good-quality counts through 2018, iPOM 2.0 uses both good- and moderate-quality counts 2007–2025. Moderate-quality counts were included in recent group model updates due to observed trends in monitoring data collected after development of iPOM 1.0. Annual pack counts documented by FWP wolf specialists have shown an overall decline since 2007 and increasing differences between good- and moderate-quality count observations (Fig. 3).
- iPOM 2.0 now uses a Montana-specific lone or dispersing wolf estimate based on GPS-collar data collected during the Nov–Dec observation period.

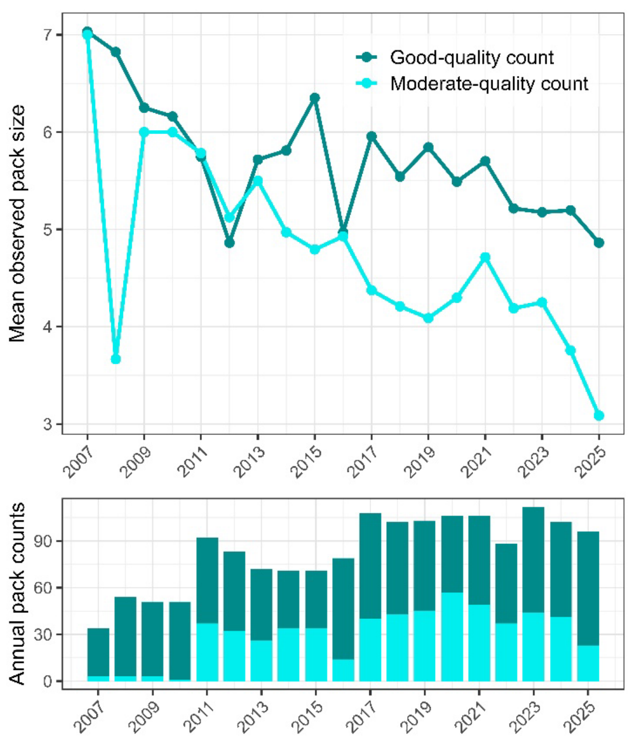

Figure 3. Mean observed pack sizes from good- and moderate-quality count observations (top panel) and the annual number of observations contributing to each count-quality class (bottom panel). Mean pack sizes from good- and moderate-quality observations were generally similar during the period used to develop the original iPOM 1.0 group-size model (through 2018) but diverged in more recent years. At the same time, moderate-quality counts became an increasingly important component of the available dataset. Together, these patterns motivated re-evaluation of the iPOM 1.0 inputs and inclusion of moderate-quality counts in iPOM 2.0**.**

Integrated Patch Occupancy Modeling Results

Area Occupied

Each year (2007 – 2025), 44,690 – 82,375 hunters responded annually to the wolf sighting surveys. From their reported sightings, 669 – 3,469 locations of 2 – 25 wolves were mapped each year. Percent of hunters reporting a wolf sighting ranged from 3.8% (2022) to 7.5% (2011).

From 2007 – 2025, iPOM 1.0 estimates of area occupied by wolf packs in Montana ranged from 39,200 km^2 (95% uncertainty interval: 33,464 – 45,682) in 2007 to 79,111 km^2 (95% uncertainty interval:73,495 – 85,690) in 2012. Updated iPOM 2.0 estimates range from 36,827 km^2 (95% uncertainty interval: 35,041 – 40,284) in 2007 to 79,887 km^2 (95% uncertainty interval: 70,229 – 89,937) in 2013 (Fig. 4, also see appendix 6).

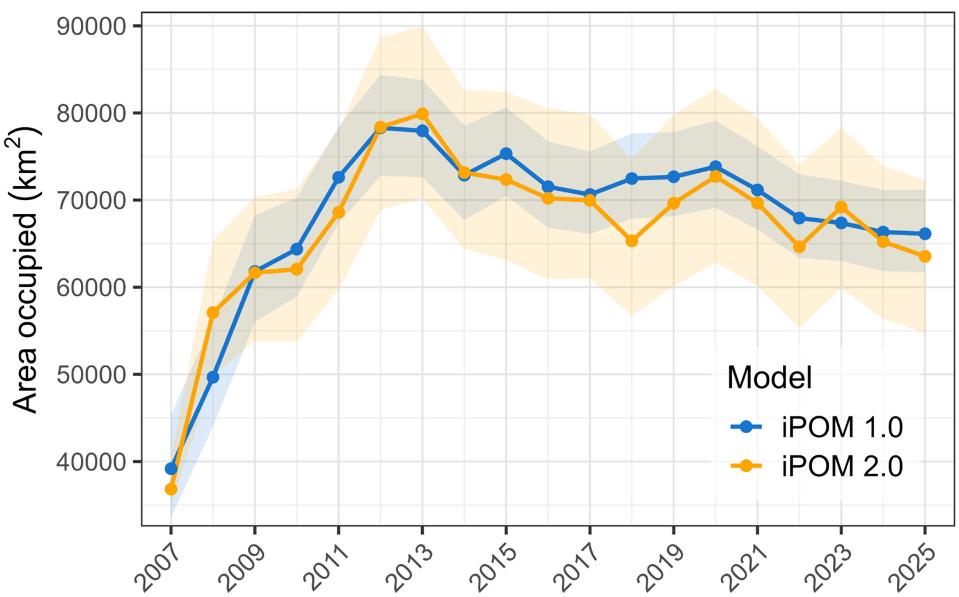

Figure 4. Estimated total area occupied (km^2) by wolves in Montana, 2007 – 2025 for iPOM 1.0 and updated iPOM 2.0. Ribbons indicate the 95% uncertainty interval.

Territory Size

Estimated territory size varied, with a median in higher-occupancy grid cells (grid cells with a median psi>0.5) of ~450 km^2 for iPOM 1.0, or ~510 km^2 under iPOM 2.0 (Fig. 5, also see appendix 6).

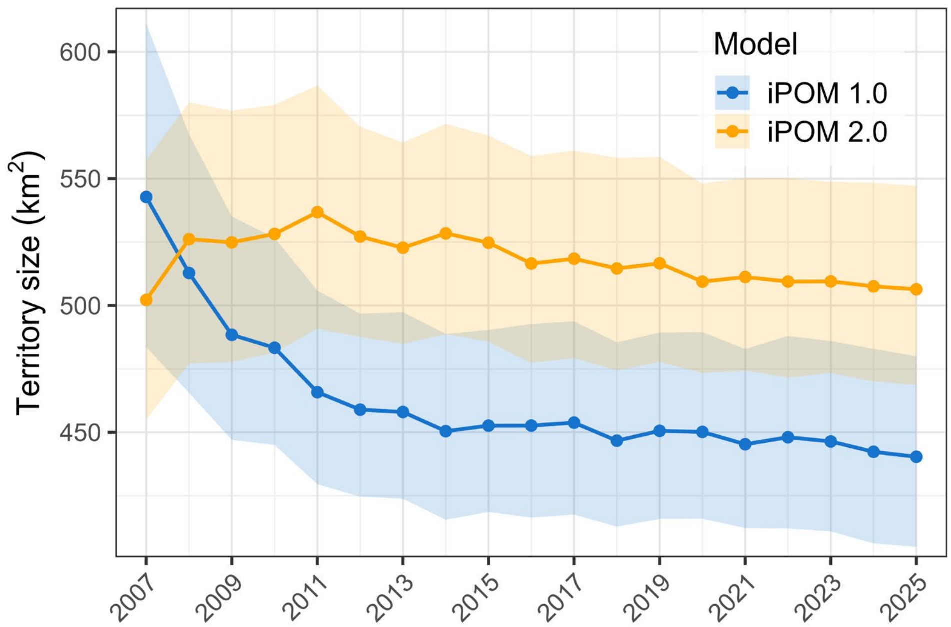

Figure 5. Estimated median territory size (km^2) of wolves in Montana, 2007 – 2025 for iPOM 1.0 and updated iPOM 2.0. Ribbons represent 95% uncertainty intervals around estimated annual median values for higher-occupancy grid cells.

Group Size

Estimated pack size also varied and has declined since ~2011, particularly in recent years under iPOM 2.0 (Fig. 6, also see appendix 6).

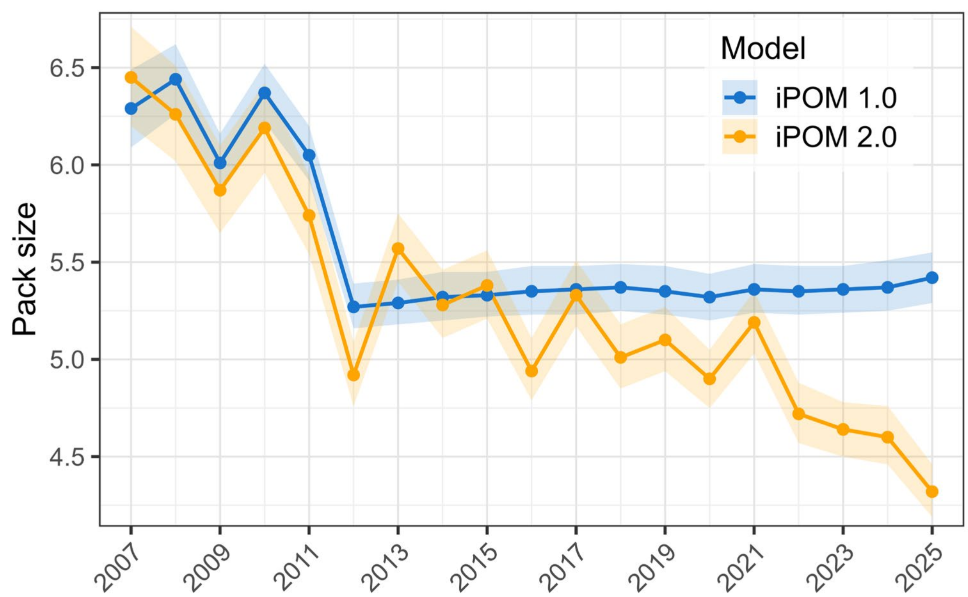

Figure 6. Estimated median pack size of wolves in Montana, 2007 – 2025 for iPOM 1.0 and updated iPOM 2.0. Ribbons represent 95% uncertainty intervals around estimated annual median values for higher-occupancy grid cells.

Estimated Number of Packs and Wolves

For 2025, iPOM 1.0 estimated 181 packs (165 – 200), and 1,094 wolves (991 – 1,211).

iPOM 2.0 estimated 155 packs (132 – 178), and 725 wolves (618 – 836). These estimates show a decline since the peak in 2013, including from the 2021 estimates of 932 wolves (796 – 1,073). Accordingly, within the iPOM 2.0 framework, estimated wolf abundance declined by approximately 22% between 2021 and 2025 (see appendix 6).

A manuscript detailing all iPOM 2.0 model updates is in progress and will be submitted for peer review and publication. These preliminary results including updated abundance estimates based on the current iPOM 2.0 framework are provided for transparency during this process.

While estimates for Montana's wolf population vary between iPOM 1.0 and iPOM 2.0, both models show a declining trend in the population 2013-2025. (Fig. 7). From 2021 – 2025, the population consisted of a 5-year average of 185 packs and 1,110 wolves per year under iPOM 1.0 (table 1) and 162 packs and 818 wolves under iPOM 2.0.

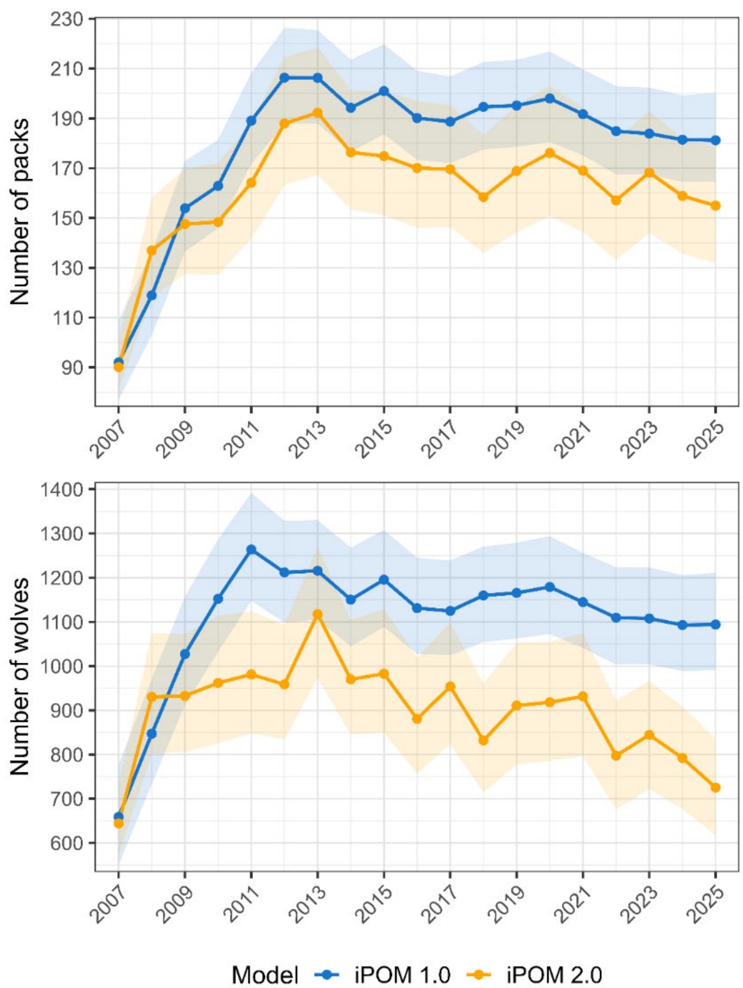

Figure 7. Estimated number of packs and wolves in Montana, 2007 – 2025 under iPOM 1.0 and iPOM 2.0. Ribbons indicate 95% uncertainty interval.

Table 1. Estimated area occupied by wolves (km^2), number of wolf packs, and number of wolves in Montana, 2007 – 2025 under iPOM 1.0. Annual numbers were based on best available information and were retroactively updated as integrated patch occupancy modeling incorporated more information each year. Estimates for iPOM 2.0 will be published in future reports.

Year	Area occupied iPOM 1.0	LCI area occupied	UCI area occupied	Packs iPOM 1.0	LCI Packs	UCI Packs	Wolves iPOM 1.0	LCI wolves	UCI wolves
2007	39174	33651	45333	92	77	109	659	551	777
2008	49674	44037	56148	119	103	136	847	734	971
2009	61807	56022	68235	154	137	173	1027	913	1157
2010	64367	58949	70266	163	146	181	1152	1033	1286
2011	72616	67388	78423	189	172	208	1264	1148	1392
2012	78290	72779	84377	206	188	226	1212	1099	1328
2013	77948	72646	83776	206	188	225	1216	1105	1330
2014	72859	67711	78549	194	177	214	1150	1045	1268
2015	75331	70503	80629	201	184	220	1196	1089	1307
2016	71526	66853	76718	190	173	209	1131	1028	1245
2017	70634	66105	75561	189	172	207	1125	1025	1239
2018	72470	67858	77642	195	178	213	1160	1054	1270
2019	72671	68155	77795	195	179	213	1166	1063	1279
2020	73828	69112	79107	198	181	217	1179	1073	1294
2021	71164	66646	76152	192	175	210	1145	1041	1256
2022	67937	63352	72929	185	168	203	1110	1003	1224
2023	67374	63018	72191	184	167	202	1108	1004	1223
2024	66328	61844	71157	181	164	199	1093	989	1205
2025	66134	61715	71170	181	165	200	1094	991	1211

Estimated numbers of packs and wolves varied spatially (Fig. 8). Estimates from iPOM 1.0 show pack and wolf abundances were consistently greater in FWP Region 1, followed by Regions 2 and 3. Regions 4 – 7 each contained ≤ 0.5% – 8% of packs and 0.4% – 8% of wolves.

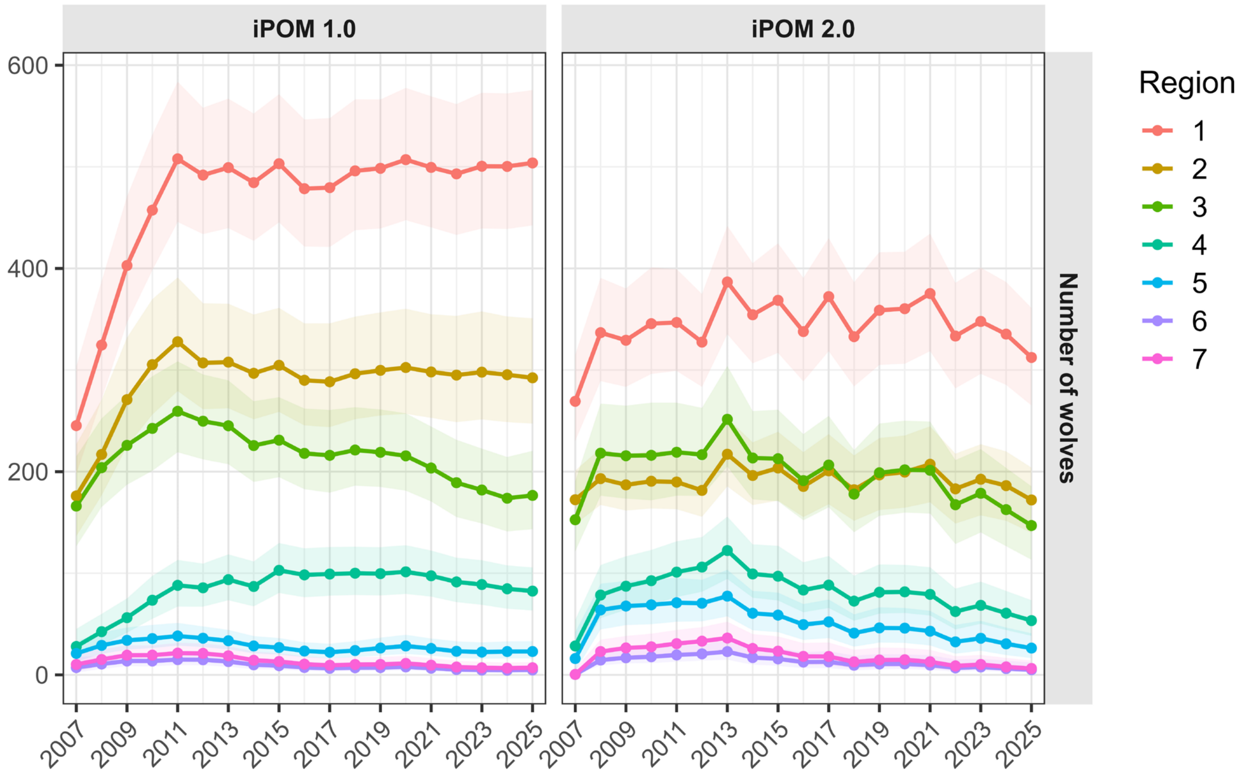

Figure 8. Estimated number of wolves in Montana and by FWP Administrative Region, 2007 – 2025 under iPOM 1.0 and iPOM 2.0. Ribbons indicate 95% uncertainty interval.

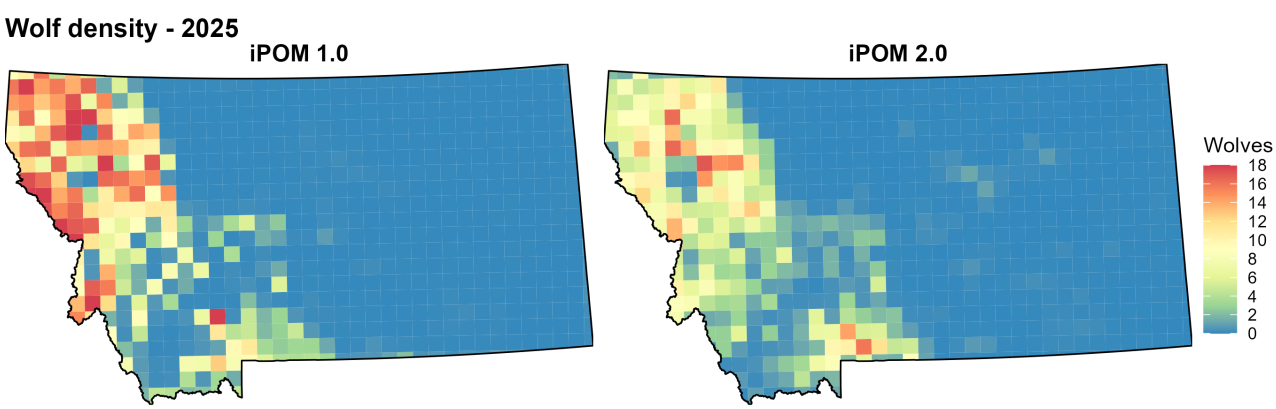

Figure 9. Estimated wolf densities in Montana, 2025**,** per 1,000 km^2, under iPOM 1.0 and 2.0.

3. WOLF MANAGEMENT

3.1 Regulated Public Hunting and Trapping

Regulated public harvest of wolves was initially recommended by the Governor's Wolf Advisory Council in the early 2000s and was incorporated into both Montana's 2004 Wolf Conservation and Management Plan and the new 2025 Wolf Plan. FWP has developed and implemented wolf harvest strategies that maintain a recovered and connected wolf population, reduce wolf-livestock conflicts, reduce wolf impacts on low or declining ungulate populations and ungulate hunting opportunities. FWP has also worked to 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. Wolf seasons are to be reviewed no less frequently than every other year by the Fish and Wildlife Commission, but in practice get reviewed annually.

Because wolf conservation and management in Montana are governed by laws enacted by the state legislature, state laws provide detailed guidance on some wolf management activities. The Montana Code Annotated (MCA) is the current law, and specific sections can be viewed at http://leg.mt.gov/bills/mca/index.html. Legislative bill language and history that has created or amended MCA sections can be accessed at http://leg.mt.gov/css/bills/Default.asp.

Several changes to wolf harvest seasons resulted from the 2021 and 2025 Montana Legislative Sessions, providing legislative intent to increase individual harvest opportunity and to reduce the state wolf population to a lower, sustainable level. Three sections of the MCA are of primary significance to recent changes in wolf harvest and season structure.

MCA 87-1-304 Fixing of Seasons and Bag and Possession Limits
MCA 87-1-901 Gray Wolf Management – Rule Making -- Reporting
MCA 87-6-214 Unlawful Contest or Prize

MCA 87-1-304 was amended in the 2021 Montana Legislative Session in response to HB 225 to adjust the trapping wolf trapping season dates. This law now provides the Montana Fish and Wildlife Commission the authority to adjust the start of the trapping season for specific wolf management units based on regional recommendations.

MCA-87-901 was amended in 2021 in response to HB 224 and SB 314. Montana statute now states trapping seasons must allow for use of snares by holders of a trapping license. This statute also provides legislative intent to reduce Montana's wolf population to a lower, sustainable level, but no lower than the number of wolves needed to maintain 15 breeding pairs. This statute further provides Commission authority to apply different management techniques depending on conditions in each administrative region to include: allowing unlimited take of wolves on a single wolf hunting or trapping license, allowing use of bait while hunting or trapping wolves, and allowing hunting of wolves on private lands outside daylight hours with use of artificial light or night vision scopes. This statute was amended again in the 2025 Montana Legislative Session to allow the use of infrared and thermal imagery scopes for night hunting of wolves on private lands.

MCA-87-6-214 was amended in 2021 in response to SB 267 to allow for reimbursements of costs associated with hunting or trapping of wolves. 2021 statutory language allowed reimbursements to be paid to “persons licensed to hunt or trap wolves.” This statute was amended again in 2025 in response to HB 219, which changed statutory language to allow for reimbursements to be paid to “persons who lawfully harvest wolves.” This amendment now allows individuals to reimbursed for killing a wolf by any lawful means designated in statute. This could include reimbursement for lawful take under Senate Bill 200 (MCA 87-1-901) or Lawful Take to Protect Livestock or Person (MCA 87-6-106).

During the 2025 Montana Legislative Session, one additional statutory modification for wolf management was made. MCA-87-5-131 removed statutory language that provided the commission the ability to reclassify wolves as a game animal or furbearer. This amendment reaffirms that wolves in Montana will continue to be managed as a species in need of management.

In their August 2025 meeting, the Commission updated wolf regulations for the 2025-2026 harvest season to balance the need to meet Montana’s legislative direction to reduce the statewide wolf population and provide harvest opportunity while minimizing risk of overharvest that could pose a risk to population stability. The Commission approved a 452 statewide wolf quota, which included a sub-quota of 60 wolves in Region 3, and separate quotas of three wolves each in Wolf Management Units 313 and 316. The Commission also established that a person may harvest 15 wolves via trapping and 15 wolves via hunting, provided that five wolves from each method of take are harvested in FWP Region 1 or Region 2. Regulations specified hunters must purchase a wolf license for each wolf they harvest via hunting, but they may purchase up to 15 licenses before going afield. In addition to these changes, the Commission also removed trapping setbacks on roads closed to motor vehicle and OHV traffic (except snowmobiles and unless in a designated no trapping area) in Mineral County and on the Spotted Bear Ranger District in northwest Montana.

To support FWP’s wolf population monitoring efforts, the Commission also added several new regulations. The first new regulation allows a trapper to gain prior authorization from FWP to temporarily leave the live wolf in the trap for the purpose of radio collaring by FWP. In this circumstance the wolf would not be harvested, but the trapper would immediately notify FWP, per the prior authorization arrangement, and a FWP official would radio collar the wolf and release it from the trap. Furthermore, the Commission approved regulation changes to require that all harvested wolves must be presented to FWP for inspection within 10 days of harvest for pelt tagging, tissue sampling, and tooth extraction. It is now illegal to leave a wolf hide and skull in the field after harvest, even if the hunter or trapper doesn’t want to keep the animal.

2025–2026 Wolf Harvest Season Quotas

- Statewide 452 wolves
- Region 3 60* wolves
- WMU 313 3 wolves
- WMU 316 3 wolves

*Region 3 quota of 60 is included in the statewide quota of 452. WMU 313 & 316 are separate from the statewide quota.

The Commission maintained the 2024 wolf trapping season, which ran January 1–February 15 inside the geographic scope identified by a federal court order (described below). Wolf trapping outside of the geographic scope identified by the federal court would run the first Monday after Thanksgiving (Dec. 1, 2025) through March 15, 2026.

At the close of the 2025-2026 wolf season (2025 License Year) on March 15, 2026, the harvest totaled 247 wolves, including 145 taken by hunters (59%) and 102 taken by trappers (41%). The 2025-2026 season harvest was the lowest observed harvest since 2016 (Fig. 10). The total calendar-year 2025 wolf harvest in Montana was 264, including 165 wolves harvested during spring of the 2024-2025 season and 99 wolves harvested during fall of the 2025-2026 season.

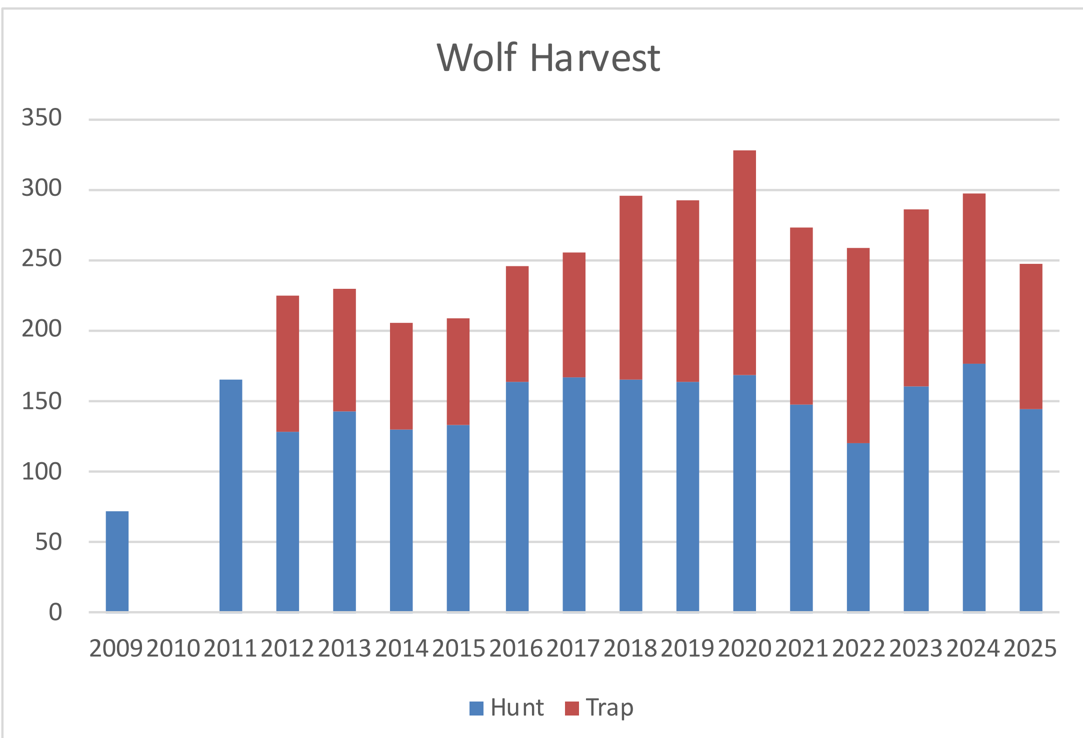

Figure 10. Number of wolves harvested in Montana by license year, separated by hunting and trapping, 2009–2025. Values drop to 0 in 2010 because wolves were briefly relisted under the Endangered Species Act and hunting and trapping were prohibited.

Federal Court Restriction on Wolf Trapping

While Montana's wolf trapping and snaring season dates are adopted each year by the Fish and Wildlife commission, a preliminary injunction issued by a federal court on November 21, 2023, limited the season due to concerns of incidental take of grizzly bears. The wolf trapping and snaring season in FWP regions 1, 2, 3, 4, and 5, as well as Hill, Blaine, and Phillips counties was limited to the time when grizzly bears are most likely to be in dens: January 1 through February 15. The State of Montana appealed the initial ruling, and on April 23, 2024, the 9th Circuit Court of Appeals affirmed the temporal scope of the injunction, but ruled the injunction was geographically too broad, and remanded for the district court to reconsider the geographic scope. On August 29, 2024, the district court entered an order reducing the geographic scope of the injunction and that ruling was incorporated into the trapping regulations during the October 2024 Commission meeting and maintained in 2025.

During calendar year 2025, Montana sold 16,223 resident wolf hunting licenses ($10 or $12/each) and 2,971 non-resident wolf hunting licenses ($25 or $50/each). In calendar year 2020 the price of a resident wolf hunting license dropped from $19 to $12 and a discounted $10 wolf hunting license was offered with the purchase of a sportsman's tag. A discounted nonresident wolf hunting license was offered for $25 with the purchase of a sportsman's tag. Sale of these wolf licenses generated $301,143 for wolf management and monitoring in Montana (Fig. 11). Total funding generated for wolf monitoring and management by the sale of wolf hunting licenses from 2009-2025 is nearly $6 million. Because trapping licenses for both residents and non-residents are not wolf-specific, FWP cannot accurately quantify the financial contribution that wolf trapping generates.

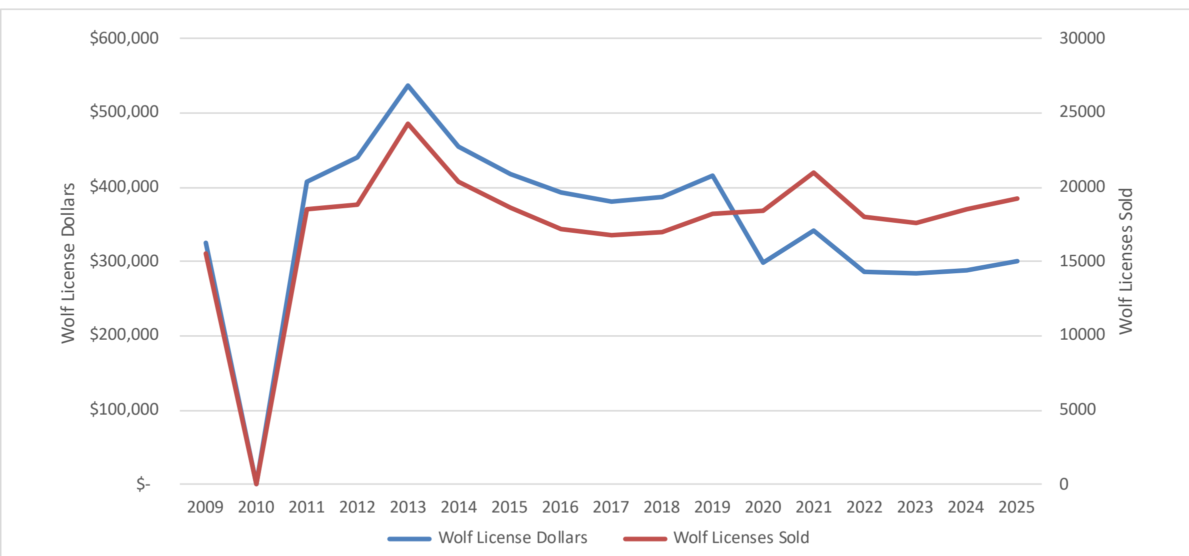

Figure 11. Annual number of wolf hunting licenses sold and dollars generated for wolf conservation and management through sales of wolf hunting licenses in Montana 2009-2025.

3.2 Wolf – Livestock Interactions in Montana

Montana wolves routinely encounter livestock on both private land and public grazing allotments. Wolves are opportunistic predators, most often seeking wild prey. However, some wolves learn to prey on livestock and teach this behavior to other wolves. The majority of cattle and sheep wolf depredation incidents confirmed by USDA Wildlife Services (WS) occur 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. Most cattle depredations occur during the spring or fall months while sheep depredations occur more sporadically throughout the year.

Wolf Depredation Reports

Wildlife Service's workload increased through 2009 as the wolf population increased and distribution expanded (Fig. 7). The number of wolf depredation complaints received since those years has declined from 233 in Federal Fiscal Year (FFY) 2009 to approximately 100 or less from FFY15-FFY25. The number of depredation complaints remained fairly stable from FFY 2024 to FFY25. Eighty-two investigations were conducted and 22 of those investigations were determined to be unrelated to wolves (Fig. 12). Since 1997, about 55% of wolf depredation reports received by WS have been verified as wolf-caused. During FFY 2025, there were fewer depredation reports, but 73% of those reports were verified as wolf depredation. It's important to note that a reported incident may involve multiple livestock, so total numbers of confirmed and probable losses may exceed the number of reports received or verified.

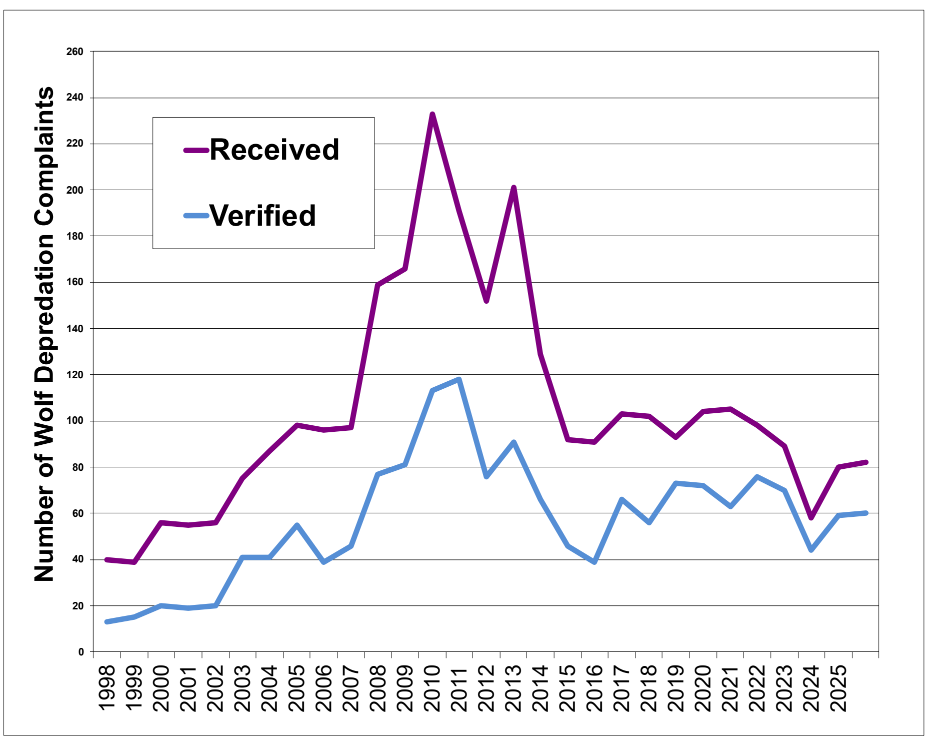

Figure 12. Number of complaints received by USDA Wildlife Services as suspected wolf damage and number of complaints verified as wolf damage, Federal Fiscal Year 1997-2025.

Wolf Depredation Incidents and Responses During 2025

Wildlife Services confirmed that in 2025, wolves killed 44 cattle, 18 sheep, 5 livestock guard dogs, and 1 livestock dog statewide. Wildlife Services also determined that an additional 15 cattle, 2 sheep, and 3 livestock guard dogs were probable wolf kills. Total confirmed cattle losses for 2025 were increased from 2024, but still substantially lower than annual average confirmed losses 2011-2024 (average since delisting). Confirmed sheep losses were similar 2024 to 2025, and confirmed livestock guard dog losses decreased slightly (Fig. 13). While these documented losses help provide valuable information on trends in livestock depredations, it's important to note that not all livestock mortalities are found. In some cases, the livestock go missing and their fate is unknown. In other cases, the carcass is found too late and has been scavenged too heavily for a depredation investigation to be conducted. Therefore, some livestock producers reported "missing" livestock and suspected wolf depredation. Others reported indirect losses including poor weight gain and reduced productivity of livestock in areas with wolf activity. While these reports are hard to confirm, there is no doubt that there are undocumented losses.

To address livestock conflicts and to reduce the potential for further depredations, 43 wolves were killed during 2025 (Fig. 13). This was lower than the average number of wolves removed due to depredation since meeting biological recovery goals in 2002 (Avg. = 62/year) and since delisting in 2011 (Avg. = 56/year). While control actions by WS are a portion of these removals, federal and state regulations since 2009 allowed private citizens to kill wolves seen in the act of attacking, killing, or threatening to kill livestock. From 2009-2025, an average of 9 wolves has been taken by private citizens each year. During calendar year 2025, 37 wolves were removed in control actions by WS and 6 wolves were killed by private citizens when wolves were seen as a threat to livestock. The general decrease in livestock depredations since 2009 (Fig. 13) may be a result of several factors, primarily more aggressive wolf control in response to depredations (DeCesare et al. 2018).

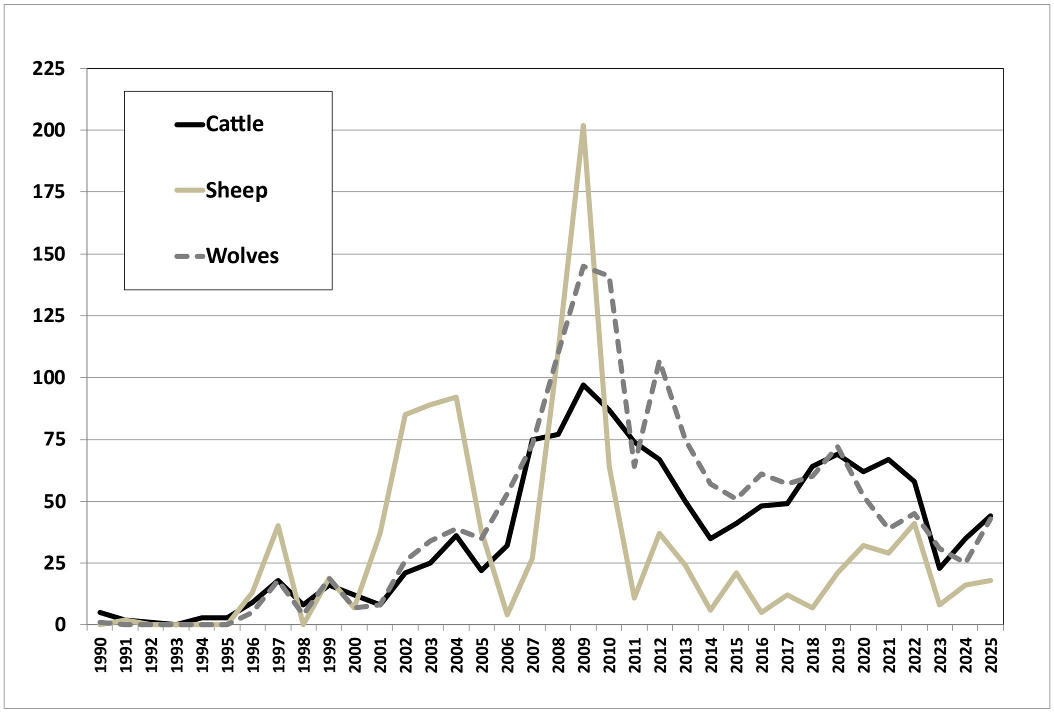

Figure 13. Number of cattle and sheep killed by wolves and number of wolves removed through agency control and legal depredation-related take by private citizens, 2000-2025.

Montana Livestock Loss Board Payments

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 Montana Livestock Loss Board are 1) to provide financial reimbursements to producers for losses caused by wolves based on the program criteria, and 2) to proactively apply prevention tools and incentives to decrease the risk of wolf-caused losses and 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 WS. Indirect losses and costs are not directly covered. Eligible livestock losses are cattle, calves, hogs, pigs, horses, mules, sheep, lambs, goats, llamas, and guard dogs. Confirmed and probable death losses are reimbursed at 100% of fair market value.

Reimbursement totals for CY2025 wolf depredations were $92,917 paid on 61 livestock and 6 livestock dogs. These numbers differ slightly from the WS confirmed losses due to wolves because reimbursements are also made for probable wolf depredations and tallied by calendar year rather than federal fiscal year. By comparison, confirmed and probable losses totaled $181,577 from grizzly bears and $11,373 from mountain lions during 2025 (Figure 14).

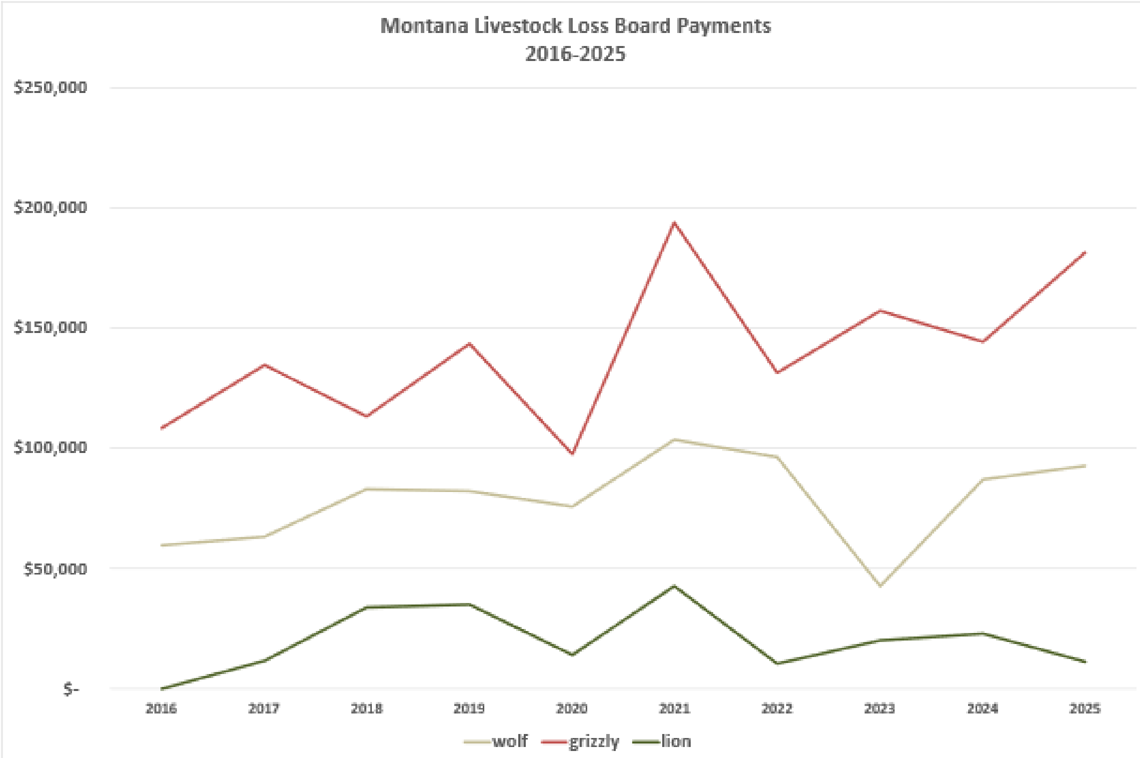

Figure 14. Dollars paid to livestock producers in Montana Livestock Loss Board payments by calendar year, 2016–2025

FWP Collaring of Livestock Packs

State Statute 87-1-623 requires FWP to allocate wolf license dollars toward collaring wolf packs in livestock areas. The purpose of these efforts is to be able to more readily understand which wolf pack may have been involved in a livestock depredation. FWP employs five wolf specialists covering all FWP Regions (Appendix 1) along with seasonal technicians in Regions 1 and 2. Wolf specialists and technicians capture wolves and deploy collars during winter helicopter capture efforts and summer-fall trapping efforts. During 2025, FWP wolf specialists captured and collared 23 wolves (Table 2). WS also captured and collared 5 additional wolves for a total of 28 statewide by both agencies.

Table 2. Wolves captured and radio-collared by FWP Wolf Specialists during 2025.

	Helicopter	Summer/Fall	**Total**
Region 1	0	3	**3**
Region 2	0	15	**15**
Region 3	3	1	**4**
Region 4	0	1	**1**
Total	**3**	**20**	**23**

Proactive Prevention of Wolf Depredation

FWP works cooperatively with livestock producers, NGOs, and WS to reduce risk of wolf-livestock conflicts by implementing a variety conflict prevention tools. Wolf specialists actively engage by sharing information, technical expertise, equipment, materials, and hands-on field assistance on a variety of efforts around the state. Furthermore, FWP continues to collaborate on research designed to improve our understanding of current and developing proactive non-lethal tools. With increasing need for funding and technical assistance to make proactive conflict prevention tools available to livestock producers, FWP encourages coordination of all stakeholders striving to reduce wolf-livestock conflicts and support working lands and wildlife. Examples of continued partnerships and new proactive conflict prevention efforts are described below.

Proactive depredation prevention work continued in Northwest Montana. Chrissy Lambert continued in her role as the Wildlife Services conflict prevention specialist for Northwest Montana and with assistance from Wildlife Services specialist Ted North, she coordinated with several groups of non-profit and FWP employees installing preventative turbo fladry to protect calving areas on private ranch land.

In West-Central Montana, FWP continued partnering on two collaborative proactive risk management projects in the Blackfoot Valley: the Blackfoot Challenge range rider program and carcass pickup program. 2025 marked the 18th year of the range rider program, which employed seasonal range riders and a permanent wildlife technician to monitor livestock and predators in areas occupied by the Arrastra Creek, Belmont, Chamberlain, Morrell Mountain, Inez, and Union Peak wolf packs. The carcass pickup program removed livestock carcasses from Blackfoot Valley ranches and transported them to the carcass compost site to reduce attractants in livestock grazing and calving areas. FWP and the Blackfoot Challenge also partnered with Wildlife Services and Defenders of Wildlife for a ninth year to deploy fladry in the Blackfoot Valley to deter wolves from livestock calving yards.

FWP was also involved in two collaborative, proactive risk management projects in the Big Hole Valley. The first of these projects, a range rider program, completed its 15th season in 2025. The second project, a carcass pickup and composting program, completed its 11th year of operation.

In north-central Montana, FWP drones were used on private land to monitor wolf activity near livestock and to actively haze wolves away from potential conflict areas, with the goal of reducing livestock depredations.

Furthermore, FWP conducted 21 educational events in north-central Montana, reaching over 588 people. Content covered basic wolf biology, wolf management, conflict prevention, and local wolf-related information. Additionally, FWP reached out to landowners to inform them of federal programs currently available to provide funding for carnivore-conflict prevention efforts such as carcass removal, fladry, and range riding programs.

The Wildlife Services-Montana Nonlethal Initiative (NLI) worked across Montana to provide assistance to livestock producers in need throughout 2025

NLI Range Riders

WS-Montana range rider programs continued in the Beaverhead National Forest and on Blackfeet Nation lands. WS-Montana range riders cover nearly 200,000 acres of rangeland as part of their official duties. There were approximately 12,000 cattle and 7,500 sheep on the allotments monitored by WS-Montana range riders. WS-Montana has identified areas of interest for potential future range riding positions and hopes to add more riders in the future.

NLI Electric Fencing and Fladry

WS-Montana completed 83 electric fencing projects throughout the state in FY25. Personnel also deployed 7 miles of fladry across 7 separate projects while livestock were more vulnerable to predation. All exclusion projects have received positive feedback, and many cooperators have recommended nonlethal methods to other producers.

NLI Outreach

WS-Montana NLI personnel provided information on electric fencing, deterrents, and range riding at 24 events across Montana, reaching 916 individuals. An NLI employee also took part in a podcast and video with a partner organization discussing the value of fladry in mitigating wolf conflicts and demonstrating proper setup. WS-Montana employees also provided technical assistance with nonlethal methods for 144 individuals seeking information.

In addition to these conflict prevention efforts, 2 NRCS Regional Conservation Partnership Program grants totaling $22 million were awarded to Heart of the Rockies Initiative (HRI) and Western Landowners Alliance (WLA) in 2024 to support producer adoption of conflict prevention tools like electric fencing (including turbo fladry), carcass pickup, and range riding. Agreements were signed, and ranking criteria were developed for project delivery in MT, OR, CO, NM, and AZ. In Montana, 52 producers signed up during the initial RCPP sign-up period in late 2024. After review, 17 producers were enrolled in contracts in late spring 2025 totaling $4.9 million. These contracts primarily supported range riding operations, with some also supporting carcass pickup and electric drive-over mats. Participating producers were concentrated in four counties: Beaverhead, Madison, Powell, and Glacier.

3.3 Total 2025 Documented Statewide Wolf Mortalities

FWP detected 328 wolf mortalities during 2025 statewide from all causes (Fig. 15). Undoubtedly, additional mortalities occurred but were not detected. Documented total wolf mortality in 2025 was 3% lower than 10-year average since 2016 (10-yr avg. = 338). Forty-three conflict removals occurred during calendar year 2025. Control actions have been decreasing since 2019, and 2025 control removals approximately one-third of peak years. Of the 43 wolves removed in 2025 to protect livestock, 37 were removed by WS, and 6 were legally killed by private citizens under Senate Bill 200 (87-1-901, MCA). Eight wolves were documented as being killed illegally, and 7 wolves were documented as being killed by vehicle or train collision. Six wolves were documented as being killed by incidental take, natural, other, or unknown causes.

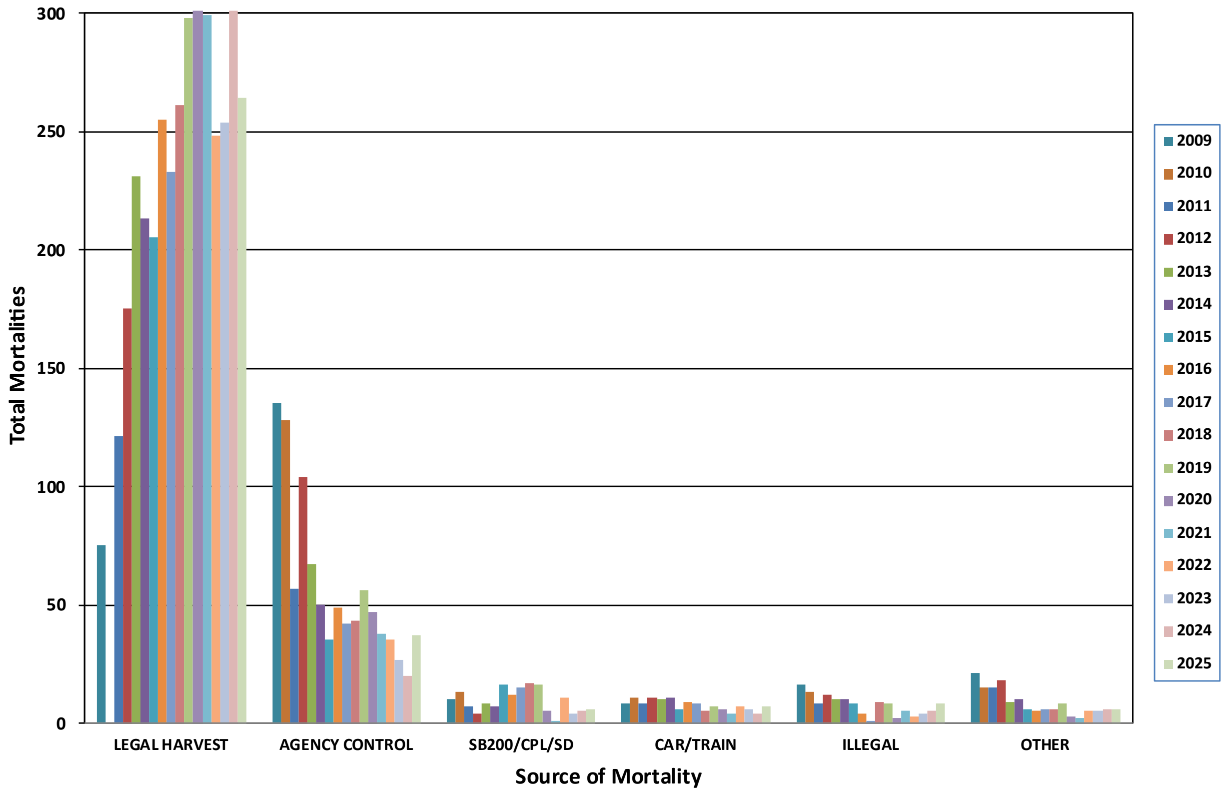

Figure 15. Minimum number of wolf mortalities documented by cause for gray wolves (2009-2025). Documented wolf mortalities during 2025 were 328.

Montana's December 31 wolf population estimate is a snapshot of the population near the midpoint in the biological year. When the harvest season concludes March 15, the population drops to the lowest point in wolf population. Then pups are born in April, boosting the population back to the high point before it begins to decline with mortalities throughout the remainder of the year and next harvest season (Fig. 16).

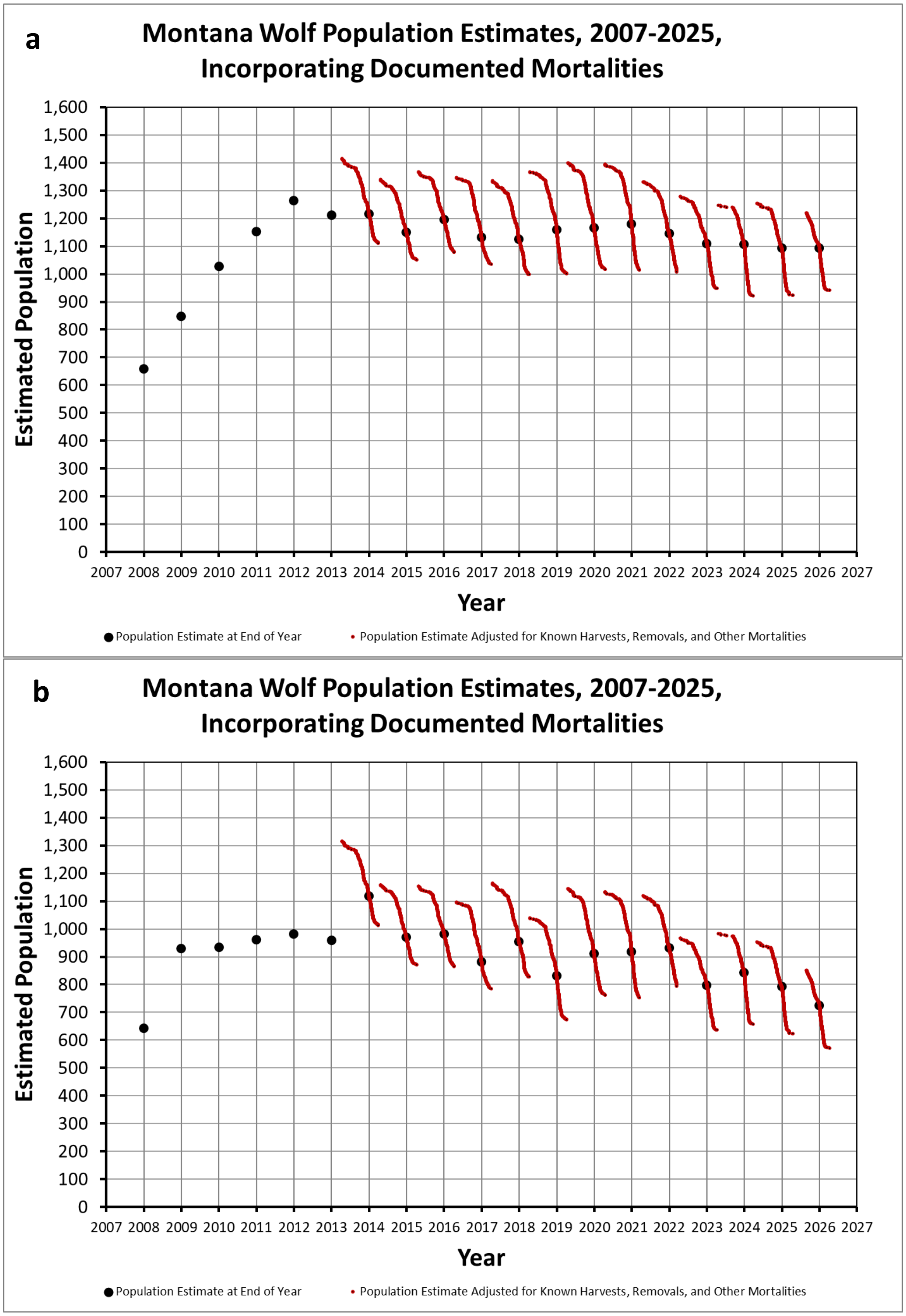

Figure 16. Estimated wolf population size based on known mortalities anchored to December 31 integrated Patch Occupancy Modelling estimates, 2007 – 2025. Panel a represents estimates under iPOM 1.0 and panel b represents estimates under iPOM 2.0

3.4 Disease Monitoring – Canine Distemper Virus

Canine distemper virus (CDV) is a highly contagious viral disease of carnivores that periodically causes substantial mortality in wolf pups, reducing recruitment and short-term population growth. Affected populations typically recover rapidly as surviving wolves develop immunity (Almberg et. al 2009). FWP is aware of recent documentation of canine distemper virus in Wyoming's wolf population and wolves in Yellowstone National Park. With population level impacts identified in these areas, FWP has increased monitoring efforts to identify potential cases of distemper in Montana wolves. Wolf specialists will collect blood samples during wolf captures for serological testing to evaluate exposure to the virus. In addition, blood and tissue samples from conflict removals and other documented wolf mortalities will be submitted for testing to determine if wolves have been exposed or infected. A suspected case of distemper was identified in the Bitterroot valley in June 2026. A yearling wolf attempted to access chickens and was legally removed by the landowner. Upon retrieval of the carcass, FWP staff identified abnormal tooth development and dentition consistent with abnormalities that would be observed in a canine that contracted distemper as a pup and survived. The carcass was transferred to the FWP health lab for evaluation. At this point, FWP has not detected any current distemper cases within wild populations in Montana.

4. 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, presentations to school groups and other agency personnel, media interviews, and formal and informal presentations, and development of social media content to share information on field monitoring work conducted by wolf specialists. In 2025, FWP also developed a "Wolves of Montana" conservation kids short book for elementary schools. In addition to these efforts, FWP published variety of media releases to help Montanans become more familiar changes to Montana's wolf management.

As new needs to enhance public understanding of Montana's wolf monitoring and management strategies are identified, FWP continues to seek solutions to improve transparency and provide information to the public. For example, in 2021 FWP developed a Wolf Harvest Dashboard website to provide real-time information on the status of wolf harvest in Montana for the current wolf hunting and trapping seasons.
https://experience.arcgis.com/experience/34fbb4c9509e45959f6291965388c345 The dashboard provides information on the number of wolves harvested in each region or WMU, the quota and quota status for each region or WMU, and detailed information for each harvest record.

5. FUNDING

5.1 Montana Fish, Wildlife & Parks Funding

Funding for wolf conservation and management in Montana is controlled by laws enacted by the state legislature. State laws also provide detailed guidance on some wolf management activities. The Montana Code Annotated (MCA) is the current law, and specific sections can be viewed at http://leg.mt.gov/bills/mca/index.html. Legislative bill language and history that has created or amended MCA sections can be accessed at http://leg.mt.gov/css/bills/Default.asp. Three sections of the MCA are of primary significance to wolf management and funding.
These are:
MCA 87-5-132 Use of Radio-tracking Collars for Monitoring Wolf Packs
MCA 87-1-623 Wolf Management Account
MCA 87-1-625 Funding for Wolf Management

MCA 87-5-132 was created during the 2005 legislative session by Senate Bill 461. It has been amended twice, both times during the 2011 legislative session, by House Bill 363 and Senate Bill 348. This law requires capturing and radio-collaring an individual within a wolf pack that is active in an area where livestock depredations are chronic or likely.

MCA 87-1-623 was created during the 2011 Legislative Session by House Bill 363. 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.

MCA 87-1-625 was created during the 2011 Legislative Session by Senate Bill 348. This law required FWP to allocate $900,000 annually toward wolf management. "Management" in MCA 87-1-625 is defined as in MCA 87-5-102, which 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. During the 2015 legislative session, Senate Bill 418 reduced this amount to $500,000 of spending authority.

The wolf management budget for state fiscal year 2025 (July 1, 2024 – June 30, 2025) was $814,964.73 and consisted of $437,494.46 of federal PR funds and $377,470.27 of Montana wolf and general license dollars.

Funding was used to pay for FWP’s field presence to implement population monitoring, collaring, outreach, hunting, trapping, and livestock depredation response. During state fiscal year 2025, the wolf program had 5 base wolf specialists/FTE dedicated to wolf management, and 1 total FTE for two 6-month technicians to increase collaring efforts in wolf packs associated with livestock. FWP also renewed the financial agreement with Wildlife Services for their role in wolf depredation management efforts. Other wolf 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.

5.2 USDA Wildlife Services Funding

WS is the federal agency that 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, WS conducts the control actions on wolves as authorized by FWP. Control actions may include radio-collaring and/or lethal removal of wolves implicated in livestock depredation events. FWP also authorizes WS to opportunistically radio-collar wolf packs that do not have an operational radio-collar attached to a member of the pack in order to fulfill the requirements of Montana State Statute 87-5-132.

As a federal agency, WS receives federal appropriated funds for predator damage management activities, but no federal funding directed specifically for wolf damage management. Prior to FFY 2011, the WS Program in Montana received about $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 2012-2025.

In FFY 2025, WS budget for conducting wolf damage management in Montana was $715,203. The FFY 2025 funding included $363,000 from Federal appropriations, including non-lethal initiative funds, $135,000 from FWP, $133,469 from the Montana Department of Livestock wolf mitigation fund, $20,000 from NGOs, and $63,734 from the Montana Livestock Loss Board.

6. PERSONNEL AND ACKNOWLEDGEMENTS

The 2025 FWP wolf specialist team included Wendy Cole, Tyler Parks, Nathan Lance, Matt Thorpe, and Sarah Zielke.

Wolf specialists worked closely with regional wildlife managers in FWP regions 1-5, including Neil Anderson, Liz Bradley, Warren Hansen, Cory Loeker, and Matt Ladd, as well as Carnivore Coordinator, Molly Parks. Wolf technicians provided seasonal assistance monitoring and trapping with the specialists in regions 1 and 2. FWP Helena and Wildlife Health Lab staff contributed time and expertise including Missy Erving, Justin Gude, Willie Schlepp, Xander Kennedy, Quentin Kujala, Greg Lemon, Ken McDonald, Adam Messer, Craig Beebe, Kevin Podruzny, Jennifer Ramsey, Matt Becker, Brian Wakeling, and Adam Petersen. The wolf team is part of a much bigger team of agency professionals that make up Montana Fish, Wildlife & Parks including regional supervisors, biologists, game wardens, information officers, front desk staff, and many others who contribute their time and expertise to wolf management and administration of the program.

FWP thanks Sarah Sells and Hannah Sipe with the Montana Cooperative Wildlife Research Unit at the University of Montana for their assistance developing 2025 iPOM wolf estimates.

FWP thanks The Blackfoot Challenge and their range riders. The Blackfoot Challenge worked with ranchers and landowners to reduce wildlife conflict in the Blackfoot watershed using range riders, fladry, and carcass pick-up.

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 and non-lethal damage management and radio-collaring activities in a timely fashion. We also thank WS for assisting with monitoring wolves and for delivering conflict prevention tools throughout Montana. WS personnel involved in wolf management in Montana during 2024 included; western district supervisor Kraig Glazier; state director Dalin Tidwell; western assistant district supervisor Chad Hoover; eastern district supervisor Doug Ekberg eastern assistant district supervisor Alan Brown; wildlife disease biologist Abrial Norwick; wildlife biologist Zack May and Trennan Dorval; helicopter pilot Eric Waldorf and Keith Olsen; helicopter/airplane pilots John Martin and Scott Snider; wildlife specialists, Glenn Hall, Micheal "Finny" Helske, Graeme McDougal, John Miedtke, Kurt Miedtke, Brian Noftsker, Ted North, Scott Olson, Christine Lambert, Luke Peeples, Cody Richardson, Jim Rost, Kirk "Skippy" Sims, Bart Smith, Brian Smith, Logan Sinclair, Pat Sinclair, Jacob Stewart, Charlie Tailfeathers, Peter Tatsey, Danny Thomason, and Dane Williams.

We acknowledge the work of the citizen-based Montana Livestock Loss Board which oversees implementation of Montana's reimbursement program and the conflict prevention grant money, and we thank the LLB's Program Manager Leslie Doley.

We thank Confederated Salish and Kootenai Tribal biologists for monitoring wolves in and around the respective tribal reservation.

The Montana Wolf Management program field operations also benefited in a multitude of ways from the continued cooperation and collaboration of other state, federal, and tribal agencies and private interests such as the USDA Forest Service, Montana Department of Natural Resources and Conservation ("State Lands"), U.S. Bureau of Land Management, Weyerhauser Company, Stimpson Lumber Company, Southern Pines Plantation, Glacier National Park, Yellowstone

National Park, Idaho Fish and Game, Wyoming Game and Fish, Nez Perce Tribe, Defenders of Wildlife, Turner Endangered Species Fund, People and Carnivores, Boulder Watershed Group, Big Hole Watershed Working Group, the Madison Valley Ranchlands Group, the upper Yellowstone Watershed Group, the Blackfoot Challenge, Defenders of Wildlife, Tom Miner Basin Association, the Granite County Headwaters Working Group, Conservation Science Collaborative, Inc., The Nature Conservancy, Natural Resource Conservation Service, Blackfeet Fish and Wildlife, Avista, and private landowners.

We deeply appreciate and thank our pilots whose unique and specialized skills, help us find wolves, get counts, assist with helicopter captures, and keep us safe in highly challenging, low altitude mountain flying situations. They include Joe Rahn (FWP Chief Pilot), and Neil Cadwell (FWP Pilot). We also thank HeliWild for their safe and efficient helicopter capture efforts.

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APPENDICES

APPENDIX 1

MONTANA CONTACT INFORMATION

Montana Fish, Wildlife & Parks

Wendy Cole
FWP Wolf Management Specialist, Kalispell
406-751-4586
wendy.cole@mt.gov

Tyler Parks
FWP Wolf Management Specialist, Missoula
406-531-4454
tylerparks@mt.gov

Matt Thorpe
FWP Wolf Management Specialist, Bozeman
406-594-7913
matt.thorpe@mt.gov

Nathan Lance
FWP Wolf Management Specialist, Butte
406-425-3355
nlance@mt.gov

Sarah Zielke
FWP Wolf Management Specialist, Great Falls
406-750-4279
szielke@mt.gov

Molly Parks
FWP Carnivore Coordinator
406-542-5509
molly.parks@mt.gov

Brian Wakeling
FWP Wildlife Management Bureau Chief
406-444-3940
brian.wakeling@mt.gov

USDA Wildlife Services

(to request investigations of injured or dead livestock):

Dalin Tidwell
USDA WS State Director, Billings
(406) 657-6464 (w)

Kraig Glazier
USDA WS West District Supervisor, Helena
(406) 439-5943 (c)

Doug Eckberg
USDA WS East District Supervisor, Columbus
(406) 657-6464 (w)
(406) 601-9213 (c)

TO REPORT A DEAD WOLF OR POSSIBLE ILLEGAL ACTIVITY:

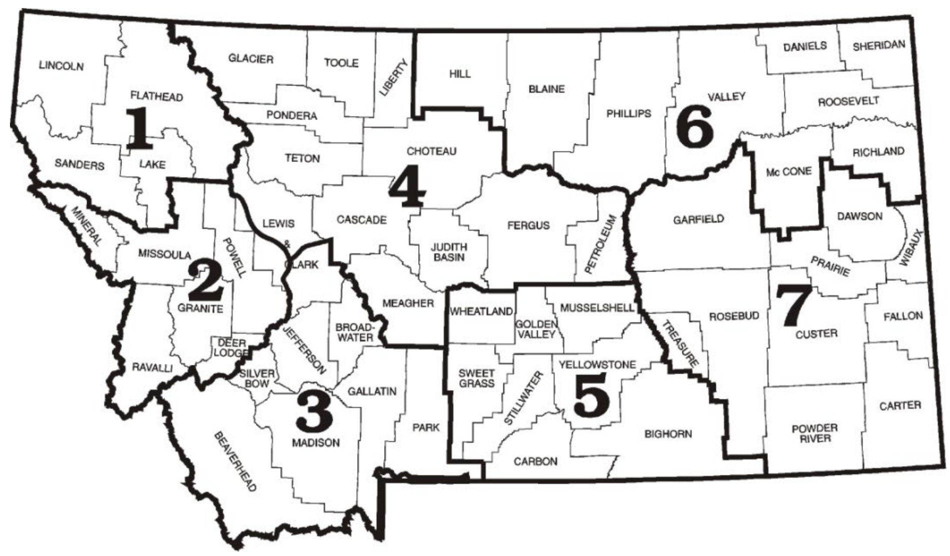
Montana Fish, Wildlife & Parks

- 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

REGION 6
54078 US Hwy 2 W
Glasgow, MT 59230
(406) 228-3700

HAVRE Area Res Office (HvARO)
2165 Hwy 2 East
Havre, MT 59501
(406) 265-6177

REGION 7
Industrial Site West
PO Box 1630
Miles City, MT 59301
(406)234-0900

APPENDIX 2

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 and predator-prey relationships to wolf-livestock relationships, policy, or wolf management. In addition, the findings of some completed projects get published in the peer-reviewed literature. The recent efforts are summarized below, with updates or project abstracts.

1. **WOLF MANAGEMENT STRATEGY EVALUATION**

Investigators: Hannah A. Sipe, Sarah N. Sells, Justin A. Gude, Kevin M. Podruzny, Molly Parks, Michael S. Lewis, Alexander L. Metcalf, and Elizabeth C. Metcalf

Status: Research in progress

This project aims to develop a decision-relevant modeling tool to inform decisions about wolf management in Montana. Management strategy evaluation (MSE) is a modeling framework that uses simulation to test how potential management strategies perform in terms of management objectives. MSE uses current understanding and available information to simulate 'truth' under different management scenarios. It also enables simulating data collection and estimation methods to evaluate how different monitoring designs impact management decisions. For wolf management in Montana, MSE will provide decision makers with an opportunity to consider both short- and long-term tradeoffs between management objectives. Ultimately, this work seeks to assist decision makers and managers in making decisions about management, including harvest, and monitoring activities.

2. ESTIMATING WOLF ABUNDANCE AND BREEDING PAIRS WITH GENETICS

Investigators: Donovan Bell, Ryan Kovach, Kevin M. Podruzny, Justin A. Gude, and Molly S. Parks

Status: Research in progress

This project aims to develop independent, genetically based estimates of the minimum number of wolf breeding pairs and total wolf abundance in Montana to complement FWP's existing Integrated Patch Occupancy Model (iPOM). Harvested wolves are genotyped with a highly informative SNP panel, and sibship analysis is used to identify successful breeding pairs represented in each harvest cohort, providing a minimum documented count of packs in Montana. This minimum count of breeding pairs, together with other genetic summaries of the harvest data (e.g., number of parent-offspring pairs, mean family size), is then used within an Approximate Bayesian Computation (ABC) framework to estimate total wolf abundance. This work adapts methods developed by Idaho Fish and Game. Together, these genetically based approaches provide an independent line of evidence that can corroborate iPOM estimates, identify areas for refinement, and help inform harvest management decisions.

APPENDIX 3

2026-2030 Wolf population forecasting report

Alixandra Godar, Molly Parks, and Justin Gude

Summary

The Fish and Wildlife Commission was directed by the 2021 Montana legislature (SB 314) to reduce wolf populations to a sustainable level that is not less than the number needed to support 15 breeding pairs (450 wolves). To support the commission's decision-making process, we made projections of the impacts of 8 human-caused mortality scenarios (annual totals of 285, 312, 345, 495, 237, 337, 437, and 537) on wolf population sizes for 2 different population scenarios. The 2 different population scenarios use estimates from integrated Patch Occupancy Model (iPOM 1.0) and an updated version of the model (iPOM 2.0). These human-caused mortality scenarios represent the recent 5-year annual mean of 37 depredation removals added to public harvest levels of 248 (the recent 5-year minimum public harvest), 275 (the recent 5-year mean public harvest), 308 (the recent 5-year maximum public harvest), 458 (the 2025-2026 License Year quota), 200, 300, 400, and 500. The latter 4 projected harvest levels represented a wide range of projected harvests, from decreased harvest to increased harvest. For example, a public harvest of 400 would be 136 more wolves than the 2025 Calendar Year (264) and 125 more than the 2021-2025 average (275) but 58 wolves less than the 2025-2026 quota of 458. The simulation scenarios are therefore intended to represent a range of public harvest levels that may be possible for comparison with current harvest trends. We generated projections with simulations from a population growth model that used past estimates of statewide wolf population size and an index of human-caused mortality rate (harvest and depredation removals during Jan 1–Dec 31 year *t* / population estimate for Dec year *t-1*) to forecast population sizes 5 years into the future. This human-caused mortality rate is an index to facilitate forecasting based on the empirical relationship with estimated growth rates. In each simulation scenario, we held total human-caused mortalities constant each future year. Forecasting results indicate that when combined with the 5-year mean (2021-2025) number of depredation removals, continued public harvest at recent levels (mean public harvest of 275 wolves or higher) would result in continued population declines in both population scenarios (iPOM 1.0 and iPOM 2.0). As the population size declines, subsequent harvests maintained at the same level would remove a larger percentage of the population, increasing the rate of decline. Wolf population size could approach levels that would not support 15 breeding pairs within the 5-year projection period if harvest continues at the current rate, in both scenarios. With the smaller population estimates, iPOM 2.0 falls below 450 wolves faster than iPOM 1.0, within 3 years under average harvest.

Methods

Annual wolf population sizes –

We used mid-winter (Dec) wolf population size estimates from an integrated patch occupancy model (iPOM) (Sells et al. 2022). With iPOM, an occupancy model estimates the extent of wolf distribution in Montana, and a territory model predicts territory sizes; together, these models predict the number of packs. A group size model predicts pack sizes. Total abundance estimates are derived by combining the estimated number of packs and pack sizes, while also accounting for lone and dispersing wolves. Further detail can be found in Sells et al. (2022) and the 2025 wolf annual report (Parks et al. 2026).

FWP has used the integrated Patch Occupancy Model (iPOM) since 2021 to estimate wolf abundance in Montana. Throughout development and implementation, iPOM has been viewed as an adaptive framework intended to evolve as new analytical methods and data become available. Recent review of the original iPOM model (hereafter referred to as iPOM 1.0) has led to a series of updates and improvements. The updated model (iPOM 2.0) produces lower abundance estimates and a more pronounced population decline. Both versions (iPOM 1.0 and iPOM 2.0) are included in the report.

Harvest and removal scenarios –

We selected 8 public harvest scenarios to represent a range of public harvest levels that may be possible to compare with maintaining current harvest trends. Current harvest trend levels included 248 (the recent 5-year minimum public harvest), 275 (the recent 5-year mean public harvest), 308 (the recent 5-year maximum public harvest), and 458 (the 2025-2026 License Year quota). Additional public harvest levels included harvest of 200, 300, 400, and 500 wolves. The 2025-2026 License Year quota and the elevated harvest levels represent increases from recent public harvest, consistent with the intent to reduce the statewide wolf population size. For example, a public harvest of 350 would be 86 more wolves than the 2025 Calendar Year (264) and 75 more than the 2021-2025 average (275).

Depredation removals are also included in the human-caused mortality scenarios. Depredation removals have been decreasing, with a minimum observed number of removals in 2024 (25 removals; Table 1) but increased to 43 removals in 2025. We used the 5-year mean number of depredation removals (37 wolves) to represent recent removal patterns. Each public harvest level was added to the 5-year mean removal for 8 human-caused mortality scenarios (annual totals of 285, 312, 345, 495, 237, 337, 437, and 537).

Table 1. Statewide Calendar Year depredation removals and wolf public harvest (hunter and trapper) from 2021 – 2025 Calendar Year.

Calendar Year	Removals	Hunter Harvest	Trapper Harvest	Total Public Harvest	Total Human Caused Mortality
2021	42	167	132	299	341
2022	46	111	137	248	294
2023	31	147	107	254	285
2024	25	183	125	308	333
2025	43	143	121	264	307

Modeling wolf population dynamics–

We used the mid-winter iPOM population estimates (Y_t, Dec of year t; Figure 1A,B) and their associated measures of uncertainty ($\sigma_{t_{observation}}$) as the input for a model of annual population dynamics which estimated the effect of the human-caused mortality rate index (Messmer and Gude 2022). Human-caused mortality (Jan 1 – Dec 31 of year t; Figure 1C) was included mandatory reported public harvest (hunting and trapping), lethal removal of wolves involved in livestock depredation by USDA Wildlife Services, and lethal wolf removal by private landowners under applicable Montana statute. For this analysis, a year is defined as the Calendar Year (Jan 1 – Dec 31) and harvest and lethal removal numbers differ from License Year totals (Tables 1 and 2). Our model took an empirical approach, modeling past annual growth rates (λ_t; Figure 1B) as a function of the annual index of human-caused mortality rate

($\mathrm{H}_t = human\ caused\ mortality_t\ /\ Y_{t-1}$; Figure 1D). This is similar to previous work by Gude et al. (2012), except here we use iPOM population estimates rather than minimum population counts, and our approach includes an observation model that accounts for uncertainty in the iPOM population estimates. It is important to note that that H_t should not be misconstrued as the actual percentage of the Dec t-1 population (Y_{t-1}) that is removed. Harvest and removals occur throughout the Calendar Year, which encompasses a birth pulse in early spring. Those young of the year are available for harvest in the 2nd half of the Calendar Year, thus the true percent of the Y_{t-1} removed is lower than H_t. Similarly, a dispersal pulse occurs in early winter with an unknown number of wolves entering and leaving the Montana population. The population model is as follows:

$$\lambda_t = Normal(\alpha + \beta_1 \times \mathrm{H}_t, \sigma_{process})$$

$$N_t = N_{t-1} \times \lambda_t$$

$$Y_t \sim Normal(N_t, \sigma_{t_{observation}})$$

where α is the regression intercept, β_1 is the slope of the relationship between annual human-caused mortality rate index and growth rate. N_t is the true, but unobserved population size, and $\sigma_{process}$ describes the variation in annual growth rates unaccounted for by the human-caused mortality rate index and driven by environmental and demographic stochasticity. While there may be some level of density dependent regulation in Montana's wolf populations, we were unable to estimate this effect because human-caused mortality and N are confounded in our 2007-2025 dataset (they both increase over the time period) and therefore these parameters were not separately identifiable in our model. Given our charge to forecast the effect of future human-caused mortality, we included that effect and not a density dependence effect. Therefore, our projections assume that human-caused mortality rate is the primary driver of population dynamics and do not account for declining recruitment associated with a saturated population, nor increases in wolf recruitment that may occur if the population is in fact reduced in the coming years (Messmer and Gude 2022).

Table 2. Statewide License Year wolf public harvest (hunter and trapper) from the 2021 – 2025 License Year. License Year 2021 includes the harvest in the 2nd half of Calendar Year 2021 and the harvest in the 1st half of Calendar Year 2022.

License Year	Hunter Harvest	Trapper Harvest	Total Public Harvest
2021	148	125	273
2022	120	138	258
2023	161	125	286
2024	176	121	297
2025	145	102	247

We fit the model in a Bayesian statistical estimation framework using JAGS software (4.3.0; Plummer 2003) executed from R via the package jagsUI (Kellner 2019), a wrapper to the package rjags (Plummer 2019). The Bayesian framework simplifies the inclusion of uncertainty in past population estimates and appropriate propagation of uncertainty into future forecasts. We generated 3 chains with 500,000 iterations, a burn-in of 50,000, and a thinning rate of 10. We assessed convergence by ensuring Gelman-Rubin convergence statistic for each parameter was <1.1 (Brooks and Gelman 1998) and that chains were well-mixed. Estimated parameters were given uninformative priors. Code for the model is given in appendix A.

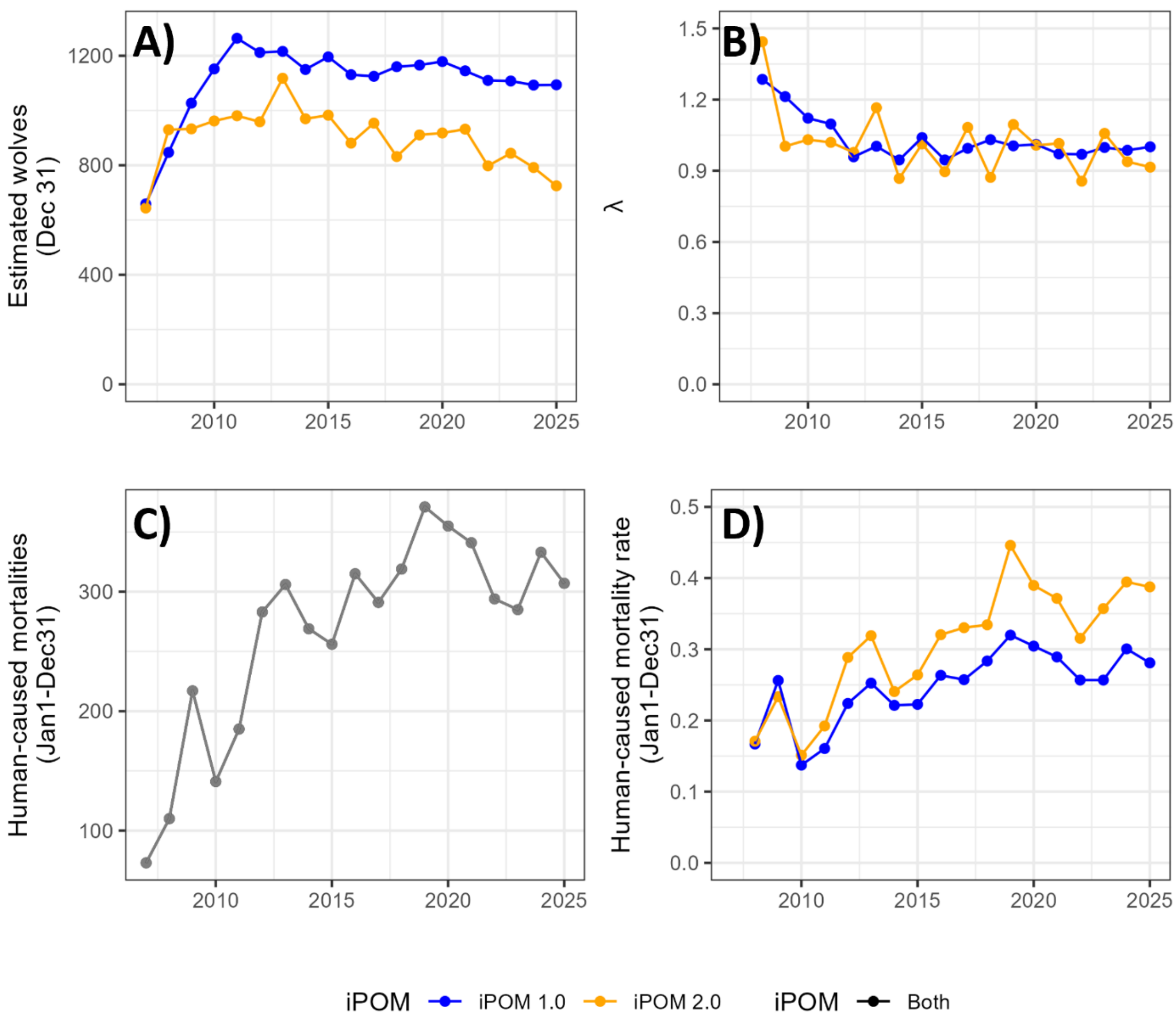


Figure 1. Statewide estimates for 2007-2025 of A) iPOM-estimated wolf population size for December each year for iPOM 1.0 (blue) and iPOM 2.0 (orange), B) estimated wolf population growth rate (λ) for iPOM 1.0 (blue) and iPOM 2.0 (orange), C) reported human-caused mortalities (between Jan 1–Dec 31) which is constant for both model versions, and D) estimated human-caused mortality rate index (H_t = human-caused mortalities$_t$ / iPOM wolves$_{t-1}$) for iPOM 1.0 (blue) and iPOM 2.0 (orange).

Results

The human-caused mortality rate index was negatively related to annual growth rates (Figures 2 and 3) as in previous studies (Gude et al. 2012). Our original model, iPOM 1.0, estimated that a human-caused mortality rate index of approximately 27.3% would result in stable annual population growth (λ = 1.00;

90% credible interval = 0.970, 1.037). The wolf population was less sensitive to the human-caused mortality rate index in iPOM 2.0, estimating an index of approximate 30.5% would result in a stable annual population growth (λ = 1.00; 90% credible interval = 0.977, 1.031). In studies from other locations with human-caused mortality, λ values ranging from 0.95–1.05 were observed when human-caused mortality rates ranged from 24–40% (Fuller et al. 2003). However, the human-caused mortality rates reported by Fuller et al. (2003) are not directly comparable to our index values. Fuller et al. (2003) reported the proportion of each population removed annually, whereas our estimate is based on the proportion of the previous population estimate harvested in the subsequent year, to facilitate forecasting, as described above.

The 2021 Montana legislature (SB 314) directed the FWP commission to reduce wolf populations to a sustainable level that is not less than the number needed to support 15 breeding pairs (450 wolves). The legislation emphasized and expanded the commission's authority to implement additional hunting and trapping regulations to accomplish this, including extended seasons, increased bag limits, and expanded hunting and trapping options such as snares, night-hunting, and the use of bait. Shortly after the commission liberalized regulations, a preliminary injunction issued by a federal court on November 21, 2023, constrained wolf trapping and snaring to limit accidental take of grizzly bears and impacted wolf harvest starting in 2023 (Montana Fish, Wildlife & Parks 2025, Parks et al. 2026). The injunction limited the trapping and snaring season to when grizzly bears were most likely to be in dens (January 1 – February 15), eliminating fall trapping and snaring. In October 2024, the current version of the federal injunction was incorporated into the Montana wolf trapping regulations. The 2024 Calendar Year had the highest total public wolf harvest in recent years, with 308 hunter and trapper harvested wolves (Table 1). Public harvest decreased in the 2025 Calendar Year (264 wolves), primarily driven by the decrease in hunter harvested wolves (143 wolves) compared to the 2024 Calendar Year (183 wolves; Table 3). Fall hunter harvest declined the most with 99 wolves harvested in the 2025 Calendar Year compared to 132 wolves in the 2024 Calendar Year.

Table 3. Statewide spring and fall public harvest for hunters and trappers from 2021 – 2025. Spring harvest falls within the previous License Year (wolves harvested in the spring of 2022 are counted in the 2021 License Year).

Calendar Year	Spring Portion of Harvest 1/1 – 3/15	Hunter	Trapper	Total Spring Harvest	Fall Portion of Harvest 9/1 – 12/31	Hunter	Trapper	Total Fall Harvest
2021	LY 2020	47	113	160	LY 2021	120	19	139
2022	LY 2021	28	106	134	LY 2022	83	31	114
2023	LY 2022	37	107	144	LY 2023	110	0	110
2024	LY 2023	51	125	176	LY 2024	132	0	132
2025	LY 2024	44	121	165	LY 2025	99	0	99

The wolf forecasting models indicate that current harvest patterns will lead to a decline over the next 5 years under either iPOM scenario (Figure 4). A harvest of 275 wolves (5-year mean) combined with the 5-year mean number of depredation removals causes declines with potential for the population to drop too low to support 15 breeding pairs (450 wolves; Montana Fish, Wildlife & Parks 2025) within a 3-year to 5-year period (iPOM 2.0 and iPOM 1.0, respectively). Though iPOM 2.0 shows wolf populations to be less sensitive to human-caused mortality than iPOM 1.0, iPOM 2.0 estimates over 300 fewer wolves in 2025 than iPOM 1.0 (Figures 4 and 5). With the smaller population, the iPOM 2.0 forecasts are more sensitive to increases in harvest, with a larger proportion of the population being harvested annually. For example, 312 human-caused mortalities (the 5-year average) is over 40% of a population of 700 wolves but about 31% of a population of 1,000 wolves. The models estimate that a human-caused mortality rate index of greater than 27.3% (iPOM 1.0) or 30.5 % (iPOM 2.0) would cause population decline (Figures 2 and 3). As harvest decreases the population size, the simulated constant harvest would lead to an exponentially increasing human-caused mortality rate. However, these greater human-caused mortality rates would be increasingly difficult to achieve in a declining population. Our scenarios do not represent harvest prescriptions or predictions of what the future harvest will be; rather they are intended to represent the possible consequences of continued public harvest at the recent harvest levels and increases that may result from more liberal regulations enacted by the commission. If any of the elevated human-caused mortality levels could be achieved, harvest levels would likely need to be reduced after 1-3 years to prevent the population from decreasing below the level needed to support 15 breeding pairs, 450 wolves, as defined in the Montana wolf plan (Montana Fish, Wildlife & Parks 2025).

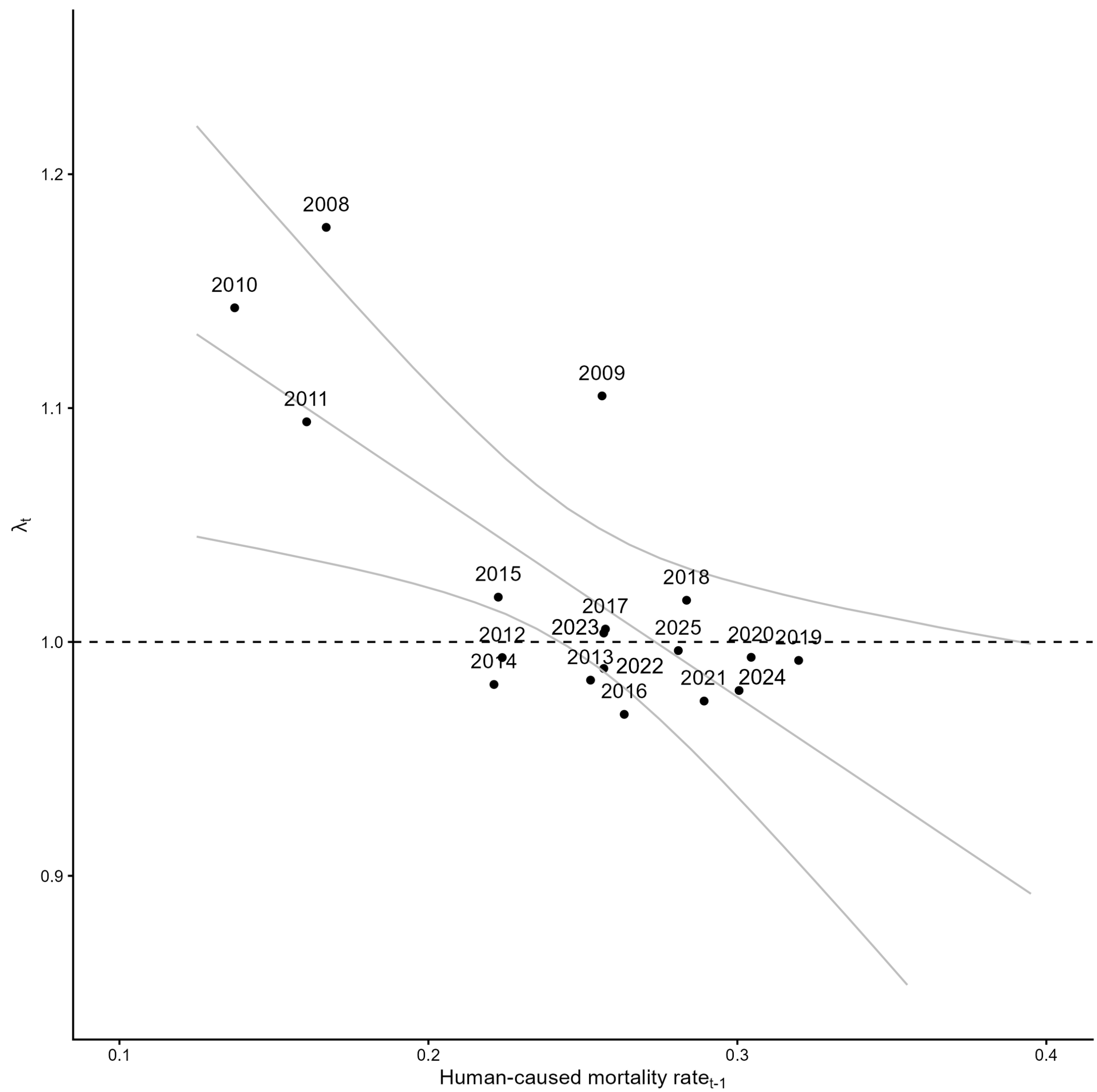


Figure 2. Estimated linear relationship and 90% credible intervals (grey lines) between annual wolf population growth rate (λ_t) and human-caused mortality rate (human-caused mortalities$_t$ / iPOM wolves$_{t-1}$) for iPOM 1.0. The human-caused mortality rate resulting in an expected stable population (λ= 1) is approximately 27.3%.

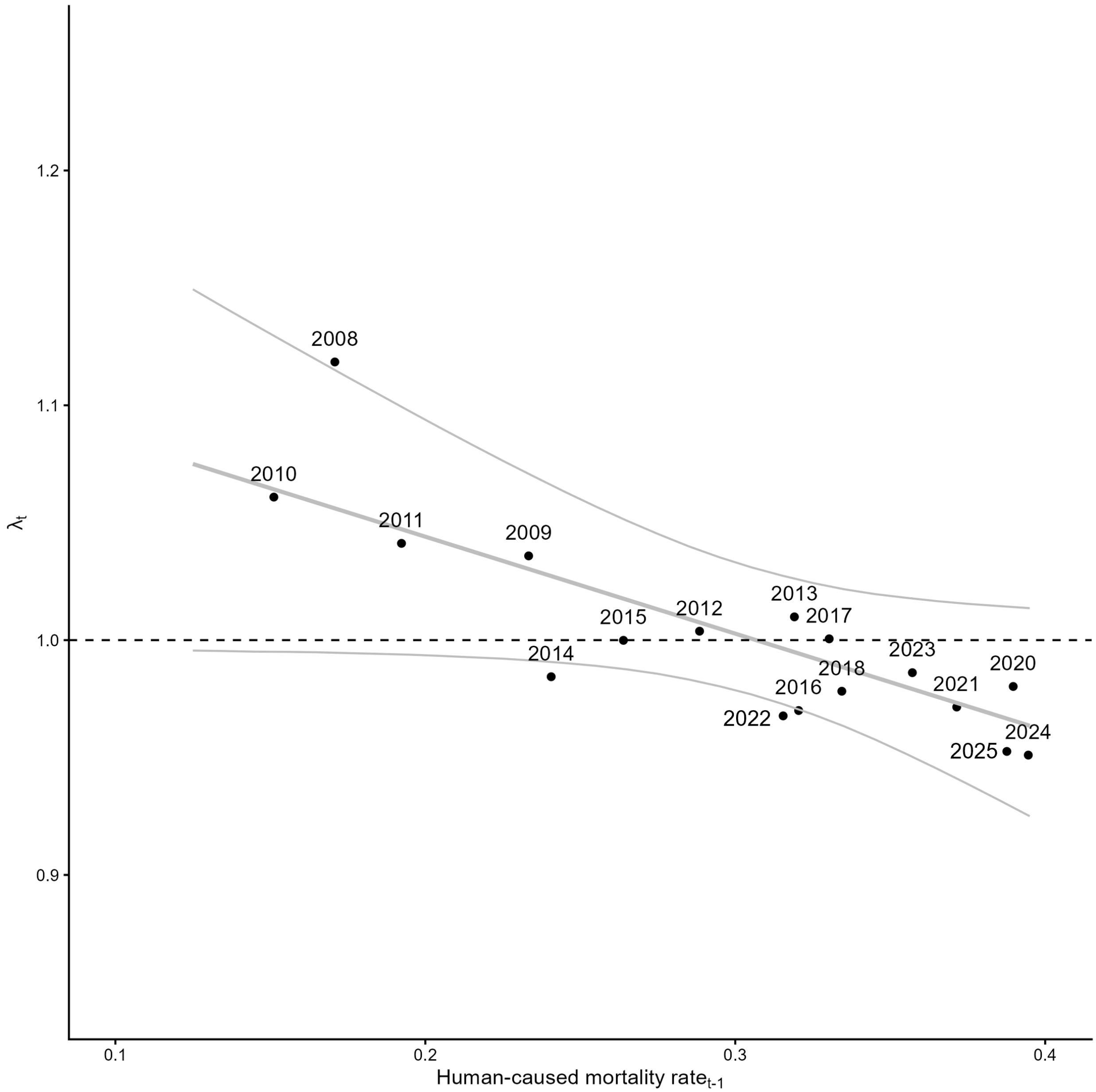


Figure 3. Estimated linear relationship and 90% credible intervals (grey lines) between annual wolf population growth rate (λ_t) and human-caused mortality rate (human-caused mortalities$_t$ / iPOM wolves$_{t-1}$) for iPOM 2.0. The human-caused mortality rate resulting in an expected stable population (λ= 1) is approximately 30.5%.

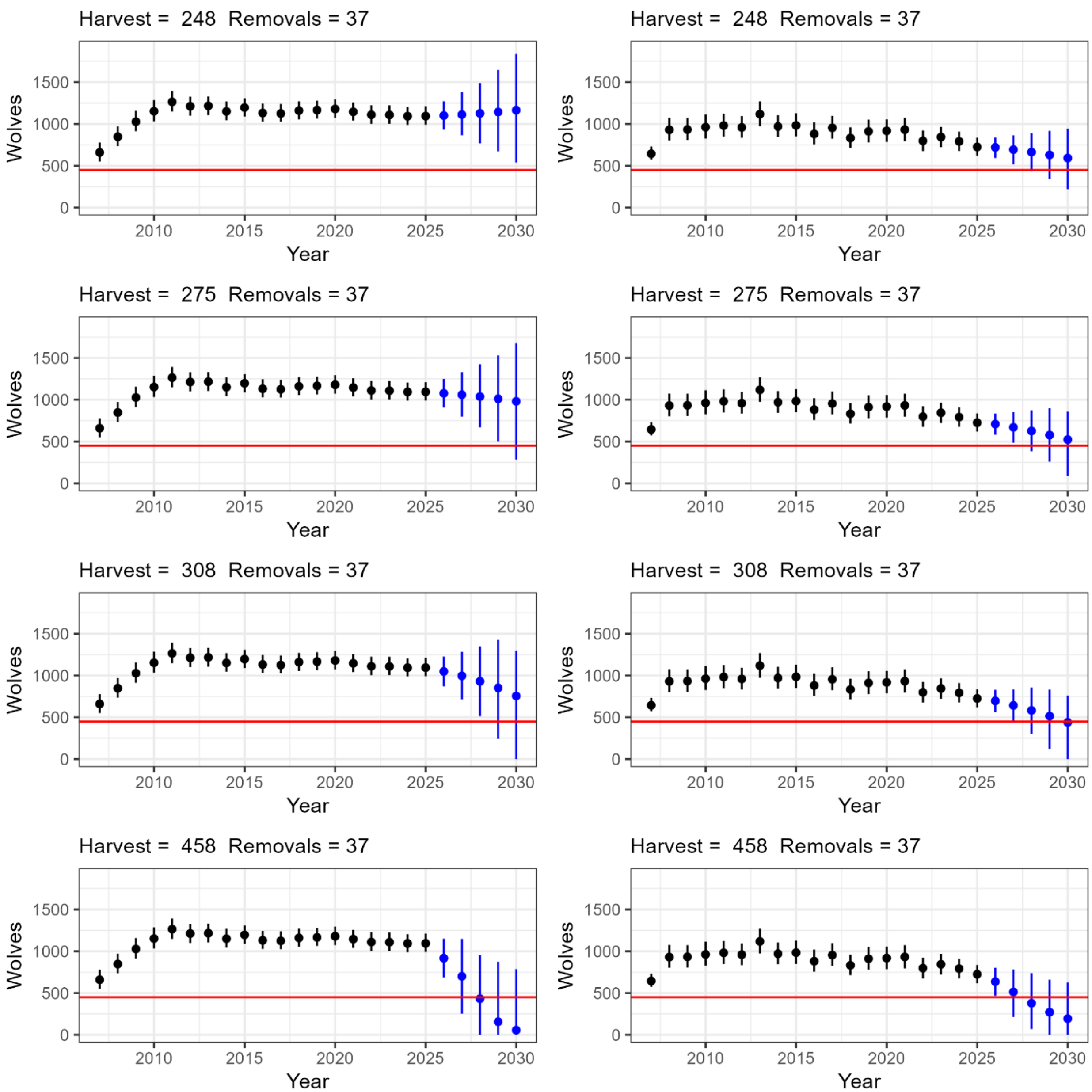


Figure 4. Wolf population model predictions under human-caused mortality (harvest and removal) scenarios with iPOM 1.0 (left column) and iPOM 2.0 (right column). Removals were held constant at the 5-year average of 37 removals from 2021-2025. The "Harvest=248" scenario represents the recent 5-year minimum hunting and trapping harvest (from 2022), the "Harvest=275" scenario represents the recent 5-year mean hunting and trapping harvest from 2021-2025, and the "Harvest=308" scenario represents the recent 5-year maximum hunting and trapping harvest (from 2024). The "Harvest=458" scenario represents the quota from the 2025-2026 License Year. Black points and error bars are iPOM estimates with 95% credible intervals; blue points and error bars are simulation results for future years with 90% prediction intervals. Red horizontal line is the minimum number of wolves (450 wolves) estimated to support 15 breeding pairs, as described in the Montana wolf plan. Panel titles reflect the human-caused mortality scenario that is projected each year into the future in that panel.

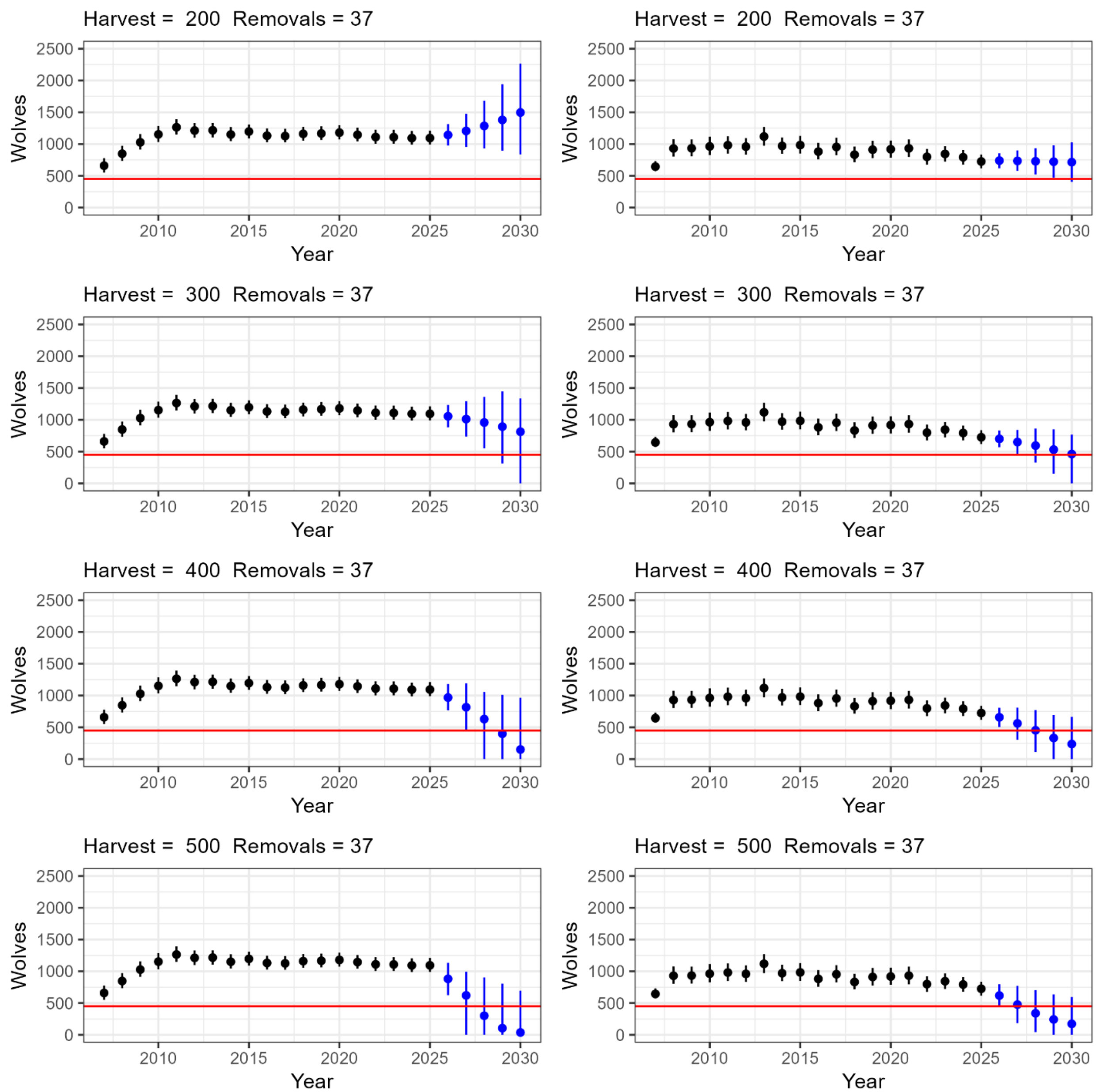


Figure 5. Wolf population model predictions under human-caused mortality (harvest and removal) scenarios with iPOM 1.0 (left column) and iPOM 2.0 (right column). Removals were held constant at the 5-year average of 37 removals from 2021-2025. Harvest levels are modeled at 100 wolf increments that encompass recent harvest and the current quota (458 wolves). Black points and error bars are iPOM estimates with 95% credible intervals; blue points and error bars are simulation results for future years with 90% prediction intervals. Red horizontal line is the minimum number of wolves (450 wolves) estimated to support 15 breeding pairs, as described in the Montana wolf plan. Panel titles reflect the human-caused mortality scenario that is projected each year into the future in that panel.

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Appendix A. Model code

```
model {

    #population model

    for(t in 1:(nyears-1)){


        # Human-caused (HC) mortality rate index calculated in simulations to allow uncertainty

        # min() prevents harvest larger than N; 1 is added to N to prevent division by 0

        HC_mort_rate[t+1]<- min(HC_mortality[t+1], N.est[t]+1) / (N.est[t] +1)


        N.est[t+1]<- max(0, N.est[t] * lambda[t+1])
```

```
        # lambda distribution is truncated to prevent values <0 in simulations where regression parameters would allow

        lambda[t+1] ~ dnorm(alpha+beta1*HC_mort_rate[t+1], sigma.proc^-2)T(0,)

    }



        sigma.proc ~ dunif(0,10)


  N.est[1] ~ dnorm(650, 57.14^-2) # 2007 iPOM estimate

  alpha ~ dnorm(0, 0.001) # intercept: predicted lambda when HC mortality rate index = 0

  beta1 ~ dnorm(0, 0.001) # slope: relationship between HC mortality rate index and lambda


  # # # #observation model - describes uncertainty in annual iPOM estimates

  for(t in 2:(nyears-5)){

      ipom[t]~ dnorm(N.est[t], se[t]^-2)

  }

}
```

APPENDIX 4

Wolf Hunting and Trapping Effort

All successful wolf hunters and trappers in Montana must personally report their wolf kill within 24 hours so that FWP can monitor harvest. Additionally, all successful hunters and trappers must present the hide and skull for inspection and registration within 10 days of kill. This information relative to harvest is gathered and maintained within a mandatory reporting database and harvest numbers are available on an online dashboard. However, not all data specific to hunter and trapper effort are collected from those successful hunters and trappers, and no effort information is gathered from unsuccessful individuals. Therefore, FWP conducts annual Hunter and Harvest Surveys to gather that additional information. Beginning in 2009 (for hunters) and 2012 (for trappers) statistical samples of wolf hunting and trapping licenses were selected, and individuals holding those licenses were contacted via telephone. To assess wolf hunting effort, hunters were asked which hunting district(s) they hunted the most and how many days they hunted in each. To assess wolf trapping effort, trappers were asked which district(s) they trapped the most, how many days they trapped in each, and how many traps/snares they set per day.

The number of wolf hunting licenses issued annually ranged from 15,520 (2009) to 24,478 (2013) (Table 1; Figure 1). The number of licenses sampled ranged from 7,953 (2020) to 13,721 (2013) and response rates varied from 47% (2021) to 68 % (2013) (Table 1).

Statewide, the number of active wolf hunters ranged from 7,457 (2022) to 15,570 (2014) (Figure 1; Table 2) and hunter days ranged from 85,882 (2022) to 228,181 (2013) (Table 3). Whereas issued hunting licenses have shown an increase in most recent years, active hunters have shown a decline. Wolf hunter numbers and hunter days were greatest in FWP Region 3 (Table 2; Table 3).

The number of trapping licenses issued to trappers with a required wolf trapping certification ranged from 1,508 (2012) to 3,124 (2013) (Table 4; Figure 2). The number of licenses sampled ranged from 1,455 (2012) to 2,113 (2013) and response rates varied from 43% (2012) to 68% (2013) (Table 4).

Statewide, the number of active wolf trappers ranged from 228 (2022) to 572 (2012) (Figure 2; Table 5) and wolf trapper days ranged from 6,647 (2022) to 21,653 (2012) (Table 6). Traps set ranged from 2,340 (2022) to 4,528 (2020) (Table 7) and trap days ranged from 59,062 (2022) to 174,135 (2012) (Table 8). Wolf trapper numbers were greatest in FWP Region 1 (Table 5), along with the greatest number of wolf trapper days (Table 6). The number of trap days were also greatest in FWP Region 1, though the number of actual traps set was greatest in Region 2 (Table 7; Table 8).

More detailed hunting and trapping effort results including estimates at the deer/elk hunting district level, estimates by hunter/trapper residency, and confidence intervals on the estimates can be found at https://myfwp.mt.gov/fwpPub/harvestReports under 'WOLF'.

Table 1. Number of issued wolf hunting licenses, number of sampled licenses, number of responses, and response rates from telephone surveys of wolf hunters in Montana, 2009 - 2025.

License Year	Number Issued	Number Sampled	Responses	Response Rate
2009	15,520	8,710	5,338	0.61
2010				
2011	17,632	9,910	6,169	0.62
2012	17,746	10,006	6,325	0.63
2013	24,478	13,721	9,334	0.68
2014	19,584	10,973	7,022	0.64
2015	18,676	10,457	6,206	0.59
2016	17,182	9,074	5,250	0.58
2017	16,847	8,848	5,743	0.65
2018	17,182	8,946	5,238	0.59
2019	18,134	9,488	5,776	0.61
2020	18,557	7,953	4,275	0.54
2021	20,847	10,200	4,816	0.47
2022	17,859	8,767	5,206	0.59
2023	17,786	8,821	5,650	0.64
2024	18,474	9,176	5,900	0.64
2025	19,313	9,472	4,849	0.51

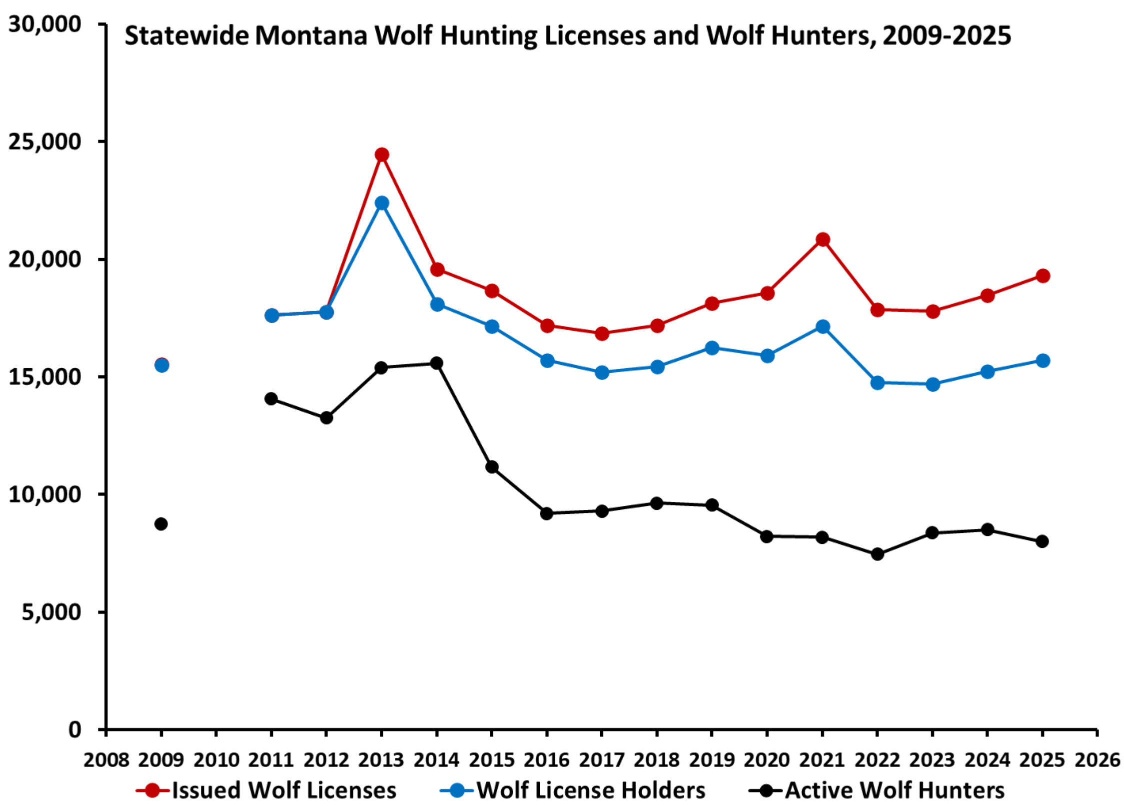

Figure 1. Number of wolf hunting licenses issued, number of hunters issued >= 1 wolf hunting license, and number of active wolf hunters estimated from Hunter Surveys in Montana, 2009 – 2025.

Table 2. Estimated number of active wolf hunters in Montana and by FWP Region, 2009 - 2025

Year	State	FWP Region 1	FWP Region 2	FWP Region 3	FWP Region 4	FWP Region 5	FWP Region 6	FWP Region 7	FWP Region Unk
2009	8,734	2,487	3,169	2,635	984	308	236	158	3
2010									
2011	14,066								
2012	13,253	2,869	3,588	5,498	2,199	784	284	290	0
2013	15,386	3,324	4,128	6,377	2,177	914	279	361	2
2014	15,570	3,317	3,930	6,992	2,254	934	239	350	11
2015	11,165	2,182	2,459	5,173	1,601	689	196	213	9
2016	9,194	2,022	2,113	4,049	1,275	446	104	141	3
2017	9,289	1,876	2,237	3,993	1,180	545	120	132	8
2018	9,629	2,085	2,343	4,072	1,410	557	145	199	3
2019	9,553	2,070	2,177	3,995	1,368	479	146	177	0
2020	8,218	1,765	1,944	3,494	1,211	398	149	217	4
2021	8,175	1,594	1,779	3,690	1,032	477	163	142	14
2022	7,457	1,501	1,764	3,166	981	424	101	138	6
2023	8,366	1,691	1,859	3,629	1,075	499	150	154	11
2024	8,496	1,811	1,993	3,490	1,175	487	116	175	38
2025	7,997	1,645	1,794	3,345	1,163	417	101	140	55

Table 3. Estimated number of wolf hunter days in Montana and by FWP Region, 2009 - 2025

Year	State	FWP Region 1	FWP Region 2	FWP Region 3	FWP Region 4	FWP Region 5	FWP Region 6	FWP Region 7	FWP Region Unk
2009	107,777	33,646	38,695	24,839	7,804	3,221	1,350	974	3
2010									
2011	178,067								
2012	181,793	41,328	43,813	63,778	20,601	7,760	2,103	2,501	0
2013	228,181	48,061	57,238	84,125	25,238	9,231	2,121	3,534	7
2014	216,620	43,320	52,512	83,145	24,045	8,443	2,363	3,502	46
2015	140,921	25,944	30,163	57,476	15,820	7,224	2,360	1,893	43
2016	121,422	24,787	27,860	49,947	13,201	4,172	1,235	1,244	19
2017	116,599	23,237	27,289	45,154	12,983	5,570	1,117	1,216	73
2018	120,168	24,217	27,193	46,272	14,041	6,082	1,215	1,672	6
2019	126,065	27,771	28,478	48,682	14,557	4,710	1,371	1,777	0
2020	104,893	20,285	22,208	42,813	11,521	4,642	1,413	1,966	44
2021	106,067	17,438	23,246	45,421	11,515	5,263	1,140	1,900	166
2022	85,882	17,329	19,289	34,187	8,066	4,465	918	1,620	8
2023	108,241	20,906	23,939	43,829	10,699	5,670	1,610	1,792	61
2024	105,668	20,284	24,429	41,689	10,575	5,535	1,404	1,421	369
2025	101,109	18,912	21,217	38,759	12,993	4,837	1,004	2,310	1,091

Table 4. Number of issued wolf trapping licenses, number of sampled licenses, number of responses, and response rates from telephone surveys of wolf trappers in Montana, 2012 - 2025.

License Year	Number Issued	Number Sampled	Responses	Response Rate
2012	1,508	1,455	620	0.43
2013	3,124	2,113	1,439	0.68
2014	2,693	1,734	1,099	0.63
2015	2,725	1,748	1,011	0.58
2016	2,509	1,484	853	0.57
2017	2,681	1,588	1,027	0.65
2018	2,516	1,497	905	0.6
2019	2,848	1,690	1,129	0.67
2020	2,851	1,576	869	0.55
2021	2,338	1,482	681	0.46
2022	1,846	1,159	647	0.56
2023	1,821	1,178	717	0.61
2024	1,816	1,187	759	0.64
2025	1,820	1,167	572	0.49

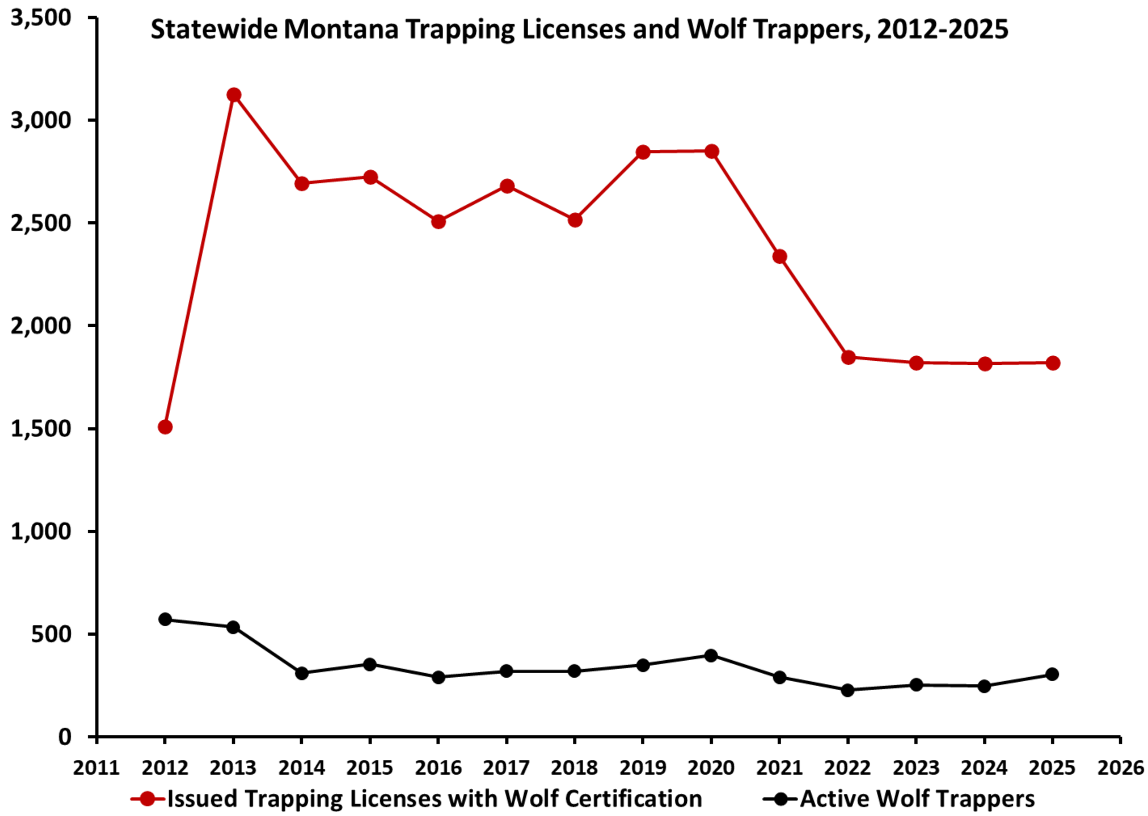

Figure 2. Number of trapping licenses issued to trappers with wolf trapping certification and number of active wolf trappers estimated from Harvest Surveys in Montana, 2012 – 2025.

Table 5. Estimated number of active wolf trappers in Montana and by FWP Region, 2012 - 2025

Year	State	FWP Region 1	FWP Region 2	FWP Region 3	FWP Region 4	FWP Region 5	FWP Region 6	FWP Region 7	FWP Region Unk
2012	572	195	173	141	34	34	0	2	0
2013	534	201	137	140	52	19	4	7	0
2014	311	123	52	91	27	15	0	3	0
2015	352	97	93	90	38	38	3	0	0
2016	291	104	96	56	30	3	0	3	0
2017	319	94	118	60	29	11	5	5	0
2018	320	101	103	67	28	21	3	3	0
2019	349	120	101	79	28	18	3	3	0
2020	397	147	105	106	27	13	0	0	0
2021	289	81	92	84	18	14	0	4	0
2022	228	88	66	57	9	9	0	0	0
2023	254	104	87	50	10	10	0	0	0
2024	247	95	103	26	19	5	2	2	2
2025	304	115	112	45	19	13	0	6	3

Table 6. Estimated number of wolf trapper days in Montana and by FWP Region, 2012 - 2025

Year	State	FWP Region 1	FWP Region 2	FWP Region 3	FWP Region 4	FWP Region 5	FWP Region 6	FWP Region 7	FWP Region Unk
2012	21,653	6,948	7,194	4,886	1,354	1,125	0	146	0
2013	21,039	8,183	5,950	4,436	1,728	706	38	13	0
2014	9,966	4,011	1,390	3,180	808	414	0	163	0
2015	10,675	2,981	2,725	2,501	1,552	721	195	0	0
2016	9,489	3,164	3,802	1,492	810	133	0	89	0
2017	9,901	2,851	4,053	1,916	680	170	175	55	0
2018	12,116	2,830	4,239	3,231	1,046	423	174	174	0
2019	12,009	3,372	3,769	3,373	661	501	167	167	0
2020	15,878	4,305	4,815	5,523	796	439	0	0	0
2021	7,524	1,762	2,016	3,044	319	170	0	213	0
2022	6,647	2,758	1,786	1,624	362	116	0	0	0
2023	7,444	2,471	2,776	1,888	170	138	0	0	0
2024	8,467	3,145	3,764	855	521	106	0	48	29
2025	10,136	3,715	3,535	1,811	413	503	0	160	0

Table 7. Estimated number of wolf traps in Montana and by FWP Region, 2012 - 2025

Year	State	FWP Region 1	FWP Region 2	FWP Region 3	FWP Region 4	FWP Region 5	FWP Region 6	FWP Region 7	FWP Region Unk
2012	4,300	1,415	1,573	845	241	207	0	20	0
2013									
2014	2,828	1,134	507	764	206	150	0	68	0
2015	3,041	647	840	866	365	277	46	0	0
2016	2,607	701	952	533	351	35	0	36	0
2017	2,754	769	1,119	518	220	63	39	26	0
2018	3,361	778	1,294	640	235	172	104	139	0
2019	3,598	1,025	1,308	863	256	146	0	0	0
2020	4,528	1,351	1,211	1,539	263	164	0	0	0
2021	3,436	615	1,037	1,363	220	152	0	50	0
2022	2,340	886	708	586	91	68	0	0	0
2023	3,764	1,659	1,167	671	159	108	0	0	0
2024	3,463	1,292	1,414	440	199	65	0	5	48
2025	3,644	1,254	1,341	768	109	154	0	10	10

Table 8. Estimated number of wolf trap days in Montana and by FWP Region, 2012 - 2025

Year	State	FWP Region 1	FWP Region 2	FWP Region 3	FWP Region 4	FWP Region 5	FWP Region 6	FWP Region 7	FWP Region Unk
2012	174,135	52,894	72,526	30,194	11,012	6,926	0	584	0
2013									
2014	96,626	36,358	16,042	27,156	7,158	5,846	0	4,066	0
2015	98,368	21,808	31,303	23,456	16,233	4,204	1,364	0	0
2016	97,262	26,895	39,818	16,250	11,636	1,591	0	1,073	0
2017	96,935	25,064	45,239	17,930	5,161	1,328	1,937	275	0
2018	133,353	24,045	53,187	28,417	9,560	3,555	6,252	8,336	0
2019	133,301	37,857	51,011	36,536	3,289	4,609	0	0	0
2020	158,921	36,149	40,962	66,941	9,396	5,473	0	0	0
2021	87,194	14,931	22,691	41,589	3,028	1,979	0	2,975	0
2022	59,062	24,342	16,144	15,677	2,038	861	0	0	0
2023	110,725	45,694	39,788	21,765	1,214	2,265	0	0	0
2024	102,078	33,583	49,978	10,831	6,326	1,024	0	48	288
2025	119,032	40,626	40,026	27,911	3,439	6,743	0	288	0

APPENDIX 5

Wolf Pack Table 2025

Pack Table Information:

Wolf Pack Column

List of all packs identified during the calendar year

Min Pack Size Dec 31 Column

Minimum confirmed or estimated pack size as of December 31

Pack Count Type & Quality Columns

Confirmed = Verified after Dec. 31 with Snow Tracks, Camera, Reliable Report, Known Mortalities.

Confirmed Good = Reliable information after Dec. 31 thought to represent entire pack.

Confirmed Moderate = Reliable information after Dec 31 but may not represent entire pack.

Confirmed Poor = Some information after Dec. 31 but not likely to represent entire pack.

Confirmed packs get a centroid and those with good or moderate counts are used to estimate pack size.

Unconfirmed/Estimated = Some information from Snow Tracks, Camera, Reliable Report, Known Mortalities, but not verified after Dec. 31.

Estimated Good = Reliable information thought to represent entire pack, but not confirmed after Dec. 31.

Estimated Moderate = Reliable information but may not represent entire pack and not confirmed after Dec. 31.

Estimated Poor/Present = Some information but not likely to represent entire pack and not confirmed after Dec. 31.

All Estimated packs get a centroid. Estimated packs with a good or moderate count are used to estimate pack size.

No Data = No information to suggest previously known pack is either present or eliminated.

No Data packs do not get a centroid lat/long. Pack count = ?. Count Type = No Data. Count Quality = No Data.

Pack Size Data Type

Notes on most significant pieces of information.

Centroid

Pack centroid (center of territory) coordinates identified for all confirmed and estimated packs.

Centroids are used in iPOM as a known wolf pack location within an iPOM grid cell.

Centroid Type

Data used to determine centroid location

Centroid Quality Code

Certain = 100% confidence the pack is present in territory with noted centroid (confirmed on the ground by specialist using variety of monitoring tools/techniques including visual observations, track surveys, howl surveys, depredation locations, wolf mortality location (conflict response or harvest) and telemetry collars.

Fairly Certain = Data combined from various sources (may include reliable hunter/trapper reports, previous year's knowledge combined with mortality data) suggest pack persistence is likely but not verified on ground by specialist

Uncertain = Some data indicates wolf activity in known territory, but not confident pack persisted through Dec. 31 or unclear if activity is from resident pack vs dispersing wolves - pack not verified on ground by specialist

Wolf Pack Table 2025

Table 1: Wolf Packs and Population Data for Montana, 2025.

REF #	WOLF PACK	FWP REGION	MINIMUM PACK SIZE DEC 31, 2025	PACK COUNT TYPE Confirmed/Estimated/No Data	PACK COUNT QUALITY	PACK SIZE DATA TYPE	2025 BREEDING PAIR?	CENTROID TYPE	CENTROID QUALITY CODE
	Apgar	1	?	No Data	No Data	No Data	?	.	.
1	Ashley	1	4	Confirmed	G	2 adults on 4/19/2025; 4 trapped early 2026	?	Recent GPS collar information	CERTAIN
2	Bearfite	1	2	Confirmed	G	cameras, 2 gray adults on 5/27, 5/28 and 8/25	?	Former GPS collar information	CERTAIN
	Bull River	1	No Data	No Data	No Data	no camera monitoring; no harvests this season	?	.	.
3	Cabinet	1	2	Confirmed	G	1 on 9/15/2025; 2 on cam in early 2025; 2 trapped early 2026	?	Prior Year Telemetry	CERTAIN
4	Candy Mountain	1	2	Confirmed	G	Tracking in area, some sign, local report, no cams; 2 harvests early 2026	?	General knowledge	FAIRLY CERTAIN
	Cilly	1	1	Estimated	G	1 on camera in May and mid-August 2025	?	.	.
5	Condon	1	3	Confirmed	G	3 adults, cameras and tracks, 1 with 1/3 tail; no pups for second year	N	Updated knowledge-shifted N	CERTAIN
	Corona	1	1	Estimated	P	scarce sign (-1 adult in August), none on camera in that area	N	.	.
6	Cowell	1	2	Estimated	M	survey cameras not as productive after high harvest and land sale; 1 adult camera 5/19 to 8/03, 2 adults 5/22	N	General knowledge	CERTAIN
7	Crane Mtn	1	3	Estimated	G	3A, 1 white-gray, 2 black on 3/27; 1 gray-white F signs of nursing, 1 black-aging gray on 4/14 & 5/1; 1A blk 8/1; 2 harvest 2025, 3 harvests 2026	Y	General Knowledge	CERTAIN
8	Dutch (Glacier NP)	1	5	Confirmed	G	5 sets of tracks on Inside North Fork Rd in Glacier, February 2026, 2 looked like subadults	Y	Prior year telemetry	CERTAIN
9	Echo	1	7	Confirmed	G	6 gray wolves seen by public Jan2026 at edge of Flathead Valley, 6 on FS cam in Graves Bay in March; 1 harvest 2025, 1 yearling on 1/24/2026	Y	updated knowledge-shifted E	CERTAIN
10	Firefighter	1	7	Confirmed	G	2 adults on cam, 1G & 1 weird bi-color black-tan 8/17; signs of nursing 6/20, carrying deer leg 6/30; 2 pups (B&W)trapped Feb2026	Y	General knowledge	CERTAIN
	~~Fisher Mountain~~	1	0	Confirmed	G	no wolves detected in this territory since 2024 (after harvest in 2023); Satire pack expanded into S/SE of this territory in Sept'25	N	.	.

REF #	WOLF PACK	FWP REGION	MINIMUM PACK SIZE DEC 31, 2025	PACK COUNT TYPE Confirmed/Estimated/No Data	PACK COUNT QUALITY	PACK SIZE DATA TYPE	2025 BREEDING PAIR?	CENTROID TYPE	CENTROID QUALITY CODE
11	Fishtrap	1	7	Confirmed	G	1 gray adult 6/11; 1 black adult 8/23; 3 trapped in 2026 incl. pup but not black adult; public cams Robert Witholm 2 gray adults late June	Y	General knowledge	CERTAIN
12	Flathead Alps	1	2	Confirmed	M	2 hunted late 2025 including pup; no surveys there	N	General knowledge	FAIRLY CERTAIN
13	Garden (CSKT)	1	2	Estimated	M	collared male dispersed out of this HR; I didn't monitor territory in 2025; WS had 2 wolves killing sheep; 1 hunted 2025, 2 trapped 2026	?	Recent GPS collar information	CERTAIN
14	Good Creek	1	2	Confirmed	M	2 gray adults May 2025; camera stolen; 1 adult in August 2025; 1 hunted 2/13/2026	?	General knowledge	CERTAIN
15	Grave Creek	1	6	Estimated	G	reports from landowners who heard howls of pups and adults in spring; 1 hunted 3/14/2026	Y	Prior year knowledge	FAIRLY CERTAIN
	Great Northern	1	No Data	No Data	No Data	no Harvest data locations in late 2024 (5 hunted early 2024); no surveys in 2025, no plans- will probably delete this next year	?	.	.
16	Half Moon	1	7	Estimated	G	survey cameras had 1 adult, sightings from logging company 5 adults; 1 adult hunter 10/26/2025, 1 yearling trapped 1/29/2026	Y	General knowledge	CERTAIN
17	Kerr	1	6	Estimated	G	pups heard by FWP employee in that area, no cam confirmation but some adult tracks and scat seen as well; 1A 1P trapped in 2026	Y	Previous GPS collar information	CERTAIN
18	Kintla	1	4	Confirmed	G	tracking in January, 4 sets of tracks	?	Prior year knowledge	CERTAIN
19	Kootenai	1	4	Confirmed	G	2 adults on survey camera Sept 2025; 4 trapped in early 2026	?	General knowledge	CERTAIN
20	Ksanka	1	5	Confirmed	G	public trustworthy camera, 2 gray adults and 3 gray pups August2025; 2 pups trapped early 2026	Y	General knowledge	FAIRLY CERTAIN
21	Lazy Crk	1	5	Confirmed	G	survey camera, 5 adults 3/17/25, 1 was limping; 1 on 4/15/25; 5 adults on 6/24/25; no reported harvest	?	General knowledge	CERTAIN
	Lost Gem	1	?	Estimated	M	3 trapped early 2025, dispersed there in winter, no resident pack in spring 2025, 1-2 passing thru Sept; 1 black adult hunted 11/21/2025	N	.	.
22	Lost Soul	1	9	Confirmed	G	4 adults incl. F w/signs of nursing & 4P in Sept2025; 8P with 3A in Aug 2025; collared disperser from Thirsty in 2026; 10 harvested this season incl. 2 pups in 2025	Y	General knowledge	CERTAIN
23	Marias	1	3	Confirmed	G	rendezvous site howl survey replies of 3+ pups & 2A; cams showed 2A gray, 3P gray into August 2025; 2 hunted 11/5/2025	N	Current year scouting & cams	CERTAIN
24	McGregor	1	4	Confirmed	G	Breeding pair and 1-2 pups on camera; 1AF hunted 10/28/2025	Y	updated from previous information	CERTAIN
	McKay	1	No Data	No Data	No Data	no Harvest data locations in late 2025 or '26; I don't do surveys there	?	.	.
25	Minton	1	5	Estimated	M	1A gray on Marten cam, scat from several pups near Porcupine Pass; lots of logging in regular area, think they shifted W to use more ID in 2025	Y	updated from previous information	CERTAIN

REF #	WOLF PACK	FWP REGION	MINIMUM PACK SIZE DEC 31, 2025	PACK COUNT TYPE Confirmed/Estimated/No Data	PACK COUNT QUALITY	PACK SIZE DATA TYPE	20225 BREEDING PAIR?	CENTROID TYPE	CENTROID QUALITY CODE
26	Mission (previously Elk Creek-Swan)	1	6	Confirmed	G	3 adults (2 black, 1 gray), 5 pups thru Sept, from many cams, howl surveys; SVC cams; 2P hunted late 2025	Y	updated from previous information	CERTAIN
27	Moore	1	5	Confirmed	G	1M 1F (signs of nursing) on survey cam July2025; 4A tracked in summer at Granger Meadows; no reported harvests, 1 found dead unknown cause Oct2025	Y	Recent GPS collar information	CERTAIN
28	Mullan	1	3	Confirmed	M	tracks, sightings, 2 harvests 2025 including Tyler's collared wolf showing territory are; 3harvests 2026	?	Recent GPS collar information	CERTAIN
29	Murphy Lake	1	7	Confirmed	G	1 adult on camera in May 2025, then their rendezvous moved nearby in August showing 5 pups, 3 adults; 1A hunted 10/25/2025	Y	updated from previous information	CERTAIN
30	Noisy	1	3	Confirmed	G	howls heard multiple times from FWP employee in that area	?	Prior year knowledge	CERTAIN
	Nyack (Glacier NP)	1	No Data	No Data	No Data	I don't do surveys in that part of the National Park, and had no info from Park biologists in that area	?	.	.
	O'Brien	1	No Data	No Data	No Data	No surveys, no harvests, no info - will try to survey next year	?	.	.
31	Pierce	1	6	Confirmed	G	tracking of 6 wolves in Beaver Creek north of Seeley in mid-March, near Lindburgh Lake; 1 trapped 1/14/2026	?	updated centroid knowledge	CERTAIN
32	Piper	1	6	Confirmed	G	tracked by SVC in early 2025, recent rendezvous found higher up late summer, sighting near hwy; 1 hunted 10/12/2025, 2 trapped 2026	Y	updated centroid knowledge	CERTAIN
33	Pleasant Valley	1	7	Confirmed	G	Survey cameras- 2 adults in May-June, 1 limping badly; 5 pups filmed by DNRC in Sept; scouting, tracks, scat; 3 trapped Jan2026	Y	updated knowledge	CERTAIN
34	Quintonkon	1	6	Estimated	G	1 Survey cam; FS visual & howling. 2P hunted 2025; 4 harvested in early 2026 incl. 2P; 2 seen by outfitter in March; disperser collar Sept-Dec	Y	updated with disperser collar	CERTAIN
35	Satire	1	6	Confirmed	G	1M collar dispersed in Nov2024, 7P 2A on cam July2025; 1 killed illegally Sept2025; 2 pups collared fall 2025: 1 hunted 11/26/25, 1 illegally trapped 12/21/2025	Y	Current GPS collar information	CERTAIN
36	Sex Peak	1	8	Confirmed	G	survey cameras, 8 in Jan; 4 adults in May, 4 pups howling; collared breeding male June 2025; 2 harvested early 2026	Y	Current GPS collar information	CERTAIN
	Solomon Mountain	1	No Data	No Data	No Data	No surveys up there, no info from bear crew around there this year	?	.	.
37	Spotted Bear	1	4	Confirmed	G	howling wolves seen by public, scat indicated reports true; cams set but stolen in fall; 3 harvested by trapping in 2026	?	updated since past GPS collar info	CERTAIN
	Summit Creek	1	No Data	No Data	No Data	No surveys up there, no info from around there this year	?	.	.
38	Sundance	1	3	Confirmed	M	wolves seen using Vermillion Pass.Irvs Creek Basin area in September	?	Past General Knowledge	CERTAIN
39	Sunday Mountain	1	2	Confirmed	M	survey camera, 1A; other camera stolen; 1A hunted 11/9/2025; some scouting indicated pack in midsummer; plan to focus more here next summer	?	General Knowledge	CERTAIN

REF #	WOLF PACK	FWP REGION	MINIMUM PACK SIZE DEC 31, 2025	PACK COUNT TYPE Confirmed/Estimated/No Data	PACK COUNT QUALITY	PACK SIZE DATA TYPE	2025 BREEDING PAIR?	CENTROID TYPE	CENTROID QUALITY CODE
40	Swamp Creek	1	5	Confirmed	G	5A Jan2025; GPS collar on 1.5 year gray male in June 2024 was trapped Jan 2025; 5A on camera in fall 2025 (1WF, 4G incl. Limpy), pups not detected	?	Current GPS collar information	CERTAIN
41	Tallulah	1	2	Estimated	M	2 adults in late summer, adjusted HR based on new knowledge of Pleasant Valley pack and recent Ashley collar; 1A hunted 10/25/2025	?	updated knowledge	CERTAIN
42	Thirsty	1	7	Confirmed	G	Survey cameras, 3 adults in July 2025; GPS collar in pack showed rendezvous clustering, dispersed Nov2025	Y	Current GPS collar information	CERTAIN
43	Thompson Peak	1	3	Estimated	M	tons of coyotes in regular cam spot, moved to area with tracking sign of 2-3 wolves in late summer but couldn't access in fall	N	Prior year knowledge	FAIRLY CERTAIN
44	Weigel	1	7	Confirmed	G	4 distinct adults on cam in July, 1 missing most of front right paw; 4 trapped in early 2026 (3 pups)	Y	Prior year knowledge	CERTAIN
45	Whale Creek	1	7	Confirmed	G	many cams- 4P, 4A; 5 in late August; 4P with white A 10/03/25; 6 indiv but not white adult playing 10/09/25; 2P hunted 10/18/25, 1P trapped 2/1/26	Y	Previous GPS collar information	CERTAIN
	Whitefish	1	No Data	No Data	No Data	No sightings, no surveys necessitated, previous denning female not seen for 3 years, deleting this pack next year	?	.	.
46	Wolf Prairie	1	4	Confirmed	M	4 trapped in early 2026, no surveys in that area	?	Prior year knowledge	FAIRLY CERTAIN
47	Yaak	1	2	Estimated	M	no good photos on 3 survey cameras where we had good detections last year; some sign during scouting	?	General Knowledge	CERTAIN
48	Alberton	2	8	Confirmed	G	Trail camera & Harvest	Y	General Knowledge	CERATIN
49	Alta	2	2	Unconfirmed/Estimated	P	Dec & Jan Reports	N	Prior GPS Data	CERATIN
50	Arrastra Creek	2	3	Confirmed	G	Summer tracks and winter reports	N	General Knowledge	CERATIN
51	Avon	2	2	Unconfirmed/Estimated	P	Reliable winter reports	N	GPS Data	CERATIN
52	Belmont	2	6	Confirmed	G	Summer tracks and collaring, Dec & Jan Reliable Reports & Harvest	Y	General Knowledge	CERATIN
53	Big Hole #	2	7	Confirmed	G	Jan Track Survey & summer collaring	Y	General Knowledge	CERATIN
54	Bonner Mtn	2	3	Unconfirmed/Estimated	M	Multiple reports from reliable sources & summer tracks	N	General Knowledge	CERATIN
55	Cache Creek #	2	7	Confirmed	G	December tracks	Y	General Knowledge	CERATIN
56	DeBorgia #	2	6	Confirmed	G	Jan Track Survey & Trail Cam	Y	General Knowledge	CERATIN

REF #	WOLF PACK	FWP REGION	MINIMUM PACK SIZE DEC 31, 2025	PACK COUNT TYPE Confirmed/Estimated/No Data	PACK COUNT QUALITY	PACK SIZE DATA TYPE	2025 BREEDING PAIR?	CENTROID TYPE	CENTROID QUALITY CODE
57	Divide Creek	2	2	Confirmed	G	Summer collaring, winter reports	N	General Knowledge	CERATIN
58	El Capitan	2	2	Confirmed	G	Jan/Feb reliable reports	N	General Knowledge	CERATIN
59	Evaro	2	3	Confirmed	G	Jan/Feb Tracks & Harvest	N	General Knowledge	CERATIN
60	Garnet Range	2	4	Confirmed	G	WS March report	?	General Knowledge	CERATIN
61	Gash Creek #	2	4	Confirmed	G	Late Dec.Trail camera	N	General Knowledge	CERATIN
62	Gird Point	2	2	Unconfirmed/Estimated	P	Reliable Jan & Feb reports and fall reports. Could be up to 7 based on reports. I found tracks but could not get numbers near Rock Creek.	N	General Knowledge	CERATIN
63	Humbug	2	2	Unconfirmed/Estimated	P	Two in Sauerkraut creek consistent reliable Jan & Feb reports	N	General Knowledge	CERATIN
64	Inez	2	2	Confirmed	G	Consistent reliable Jan & Feb reports, harvest	N	General Knowledge	CERATIN
65	Lolo	2	7	Confirmed	G	Summer collaring, harvest, Feb trail cam	Y	General Knowledge	CERATIN
66	Mineral Mountain	2	2	Unconfirmed/Estimated	p	Summer tracks & scat	N	General Knowledge	CERATIN
67	Morrell Mountain	2	7	Confirmed	G	Harvest, Jan-Feb reliable reports, March camera	Y	General Knowledge	CERATIN
68	Murphy Peak	2	6	Confirmed	G	Feb track survey & harvest	Y	General Knowledge	CERATIN
69	Ninemile	2	3	Unconfirmed/Estimated	M	Jan Tracks & harvest	N	General Knowledge	CERATIN
70	Olson Peak	2	5	Confirmed	G	Feb Tracks	Y	General Knowledge	CERATIN
71	One Horse	2	4	Confirmed	G	Jan Trail Camera	N	General Knowledge	CERATIN
72	Overwhich #	2	5	Confirmed	G	Summer tracks & trail camera, reliable Jan-Feb reports	N	General Knowledge	CERATIN
73	Petty Creek	2	2	Unconfirmed/Estimated	M	Summer tracks, trail camera, reliable reports, harvest	N	GPS Data	CERATIN
74	Pierce	2	2	Unconfirmed/Estimated	P	Reports of 2 to 3, but no reliable count info	N	General Knowledge	CERATIN

REF #	WOLF PACK	FWP REGION	MINIMUM PACK SIZE DEC 31, 2025	PACK COUNT TYPE Confirmed/Estimated/No Data	PACK COUNT QUALITY	PACK SIZE DATA TYPE	2025 BREEDING PAIR?	CENTROID TYPE	CENTROID QUALITY CODE
75	Quartz Creek	2	8	Confirmed	G	December tracks and harvest	Y	General Knowledge	CERATIN
76	Ross' Fork	2	7	Confirmed	G	Jan, Feb Tracks & reliable reports	Y	General Knowledge	CERATIN
77	Seeley Lake	2	4	Confirmed	G	Summer trail camera, harvest and reliable Jan-Feb reports	N	General Knowledge	CERATIN
78	Silver Lake #	2	4	Unconfirmed/Estimated	M	Summer tracks and scats	Y	General Knowledge	CERATIN
79	Sliderock Mountain	2	5	Confirmed	G	Summer tracks, cameras, and reliable Jan- Feb reports	N	General Knowledge	CERATIN
80	Stonewall Mountain	2	2	Confirmed	G	Summer WS report, Reliable Jan Report	N	General Knowledge	CERATIN
81	Sula	2	5	Unconfirmed/Estimated	M	Reliable jan & feb reports summer tracks & scat	?	Prior GPS data	CERATIN
82	Sunrise Mountain	2	4	Confirmed	G	Summer trail camera, winter trail camera 2 gray 2 black	?	General Knowledge	CERATIN
83	Tarkio	2	5	Unconfirmed/Estimated	G	Summer Trail camera, reliable Jan, Feb reports	Y	Prior GPS data	CERATIN
84	Trail Creek	2	2	Unconfirmed/Estimated	P	Jan- Feb Reports	N	General Knowledge	CERATIN
85	Telephone Butte	2	4	Confirmed	G	Nov Trail Camera, harvest, summer trail camera	N	General Knowledge	CERATIN
86	Tepee Point	2	2	Unconfirmed/Estimated	P	Reports of more, but unconfirmed, summer tracks	N	GPS Data	CERATIN
87	Trapper Peak	2	7	Confirmed	G	Feb trail cam	Y	Prior GPS data	CERATIN
88	Watchtower #	2	2	Unconfirmed/Estimated	P	Reliable Dec & Jan Reports	N	General Knowledge	CERATIN
89	Anaconda	3	5	Confirmed	G	reports, cameras, tracking, harvest	?	General Knowledge	CERATIN
90	Elkhorn 2	3	2	Confirmed	G	reports, cameras, harvest, tracking	N	General Knowledge	CERATIN
91	Pyramid #	3	2	Confirmed	G	cameras, reports, tracking	N	General Knowledge	CERATIN
92	Thunderbolt	3	2	Confirmed	M	reports, harvest, tracking	N	General Knowledge	CERATIN
93	Beartrap	3	14	Confirmed	G	Flights, harvest, cameras, tracking	Y	Collars, general knowledge	CERATIN

REF #	WOLF PACK	FWP REGION	MINIMUM PACK SIZE DEC 31, 2025	PACK COUNT TYPE Confirmed/Estimated/No Data	PACK COUNT QUALITY	PACK SIZE DATA TYPE	2025 BREEDING PAIR?	CENTROID TYPE	CENTROID QUALITY CODE
94	Snowcrest #	3	2	Confirmed	G	flights,cameras, harvest, tracking	N	General Knowledge, collars	CERATIN
95	Antone	3	4	Confirmed	G	cameras, flights, harvest,control, reports, tacking	Y	Collars, general knowledge	CERATIN
96	Toadflax	3	3	Confirmed	G	Flights, harvest, cameras, reports, tracking	N	Collars, general knowledge	CERATIN
97	West Pioneers	3	5	Confirmed	M	Flights, harvest, cameras, reports, tracking	Y	Collars, general knowledge	CERATIN
98	West Gallatin	3	2	Confirmed	M	harvest, cameras, reports, tracking	Y	general knwledge	CERATIN
99	Dome Mtn	3	2	Unconfirmed/Estimated	P	harvest, cameras, reports, tracking	Y	Collars, general knowlede	CERTAIN
100	Rock Creek	3	2	Unconfirmed/Estimated	P	2 harvested January 2025, reports,	N	Collars, general knowlede	CERTAIN
101	Sphinx Mountain	3	3	Unconfirmed/Estimated	P	GPS collar, YNP flight pictures, harvest	Y	Current GPS collar information	CERTAIN
102	Storm Castle	3	4	Confirmed	M	reports, 2 harvested early 2025	Y	general knowledge	CERTAIN
	Cinnamon Peak	5	No data	Unconfirmed/Estimated	No data	1 harvest in January, no other confirmed reports	?	.	.
	East Boulder	5	No data	Unconfirmed/Estimated	No data	1 harvest in January, confirmed track of single wolves	?	.	.
	Big Timber Ck	5	No data	Unconfirmed/Estimated	No data	no harvest, no reports	?	.	.
103	Dog Gun	4	3	Estimated	M	FWP Rendezvous Site Confirmation, GPS Collar Data, Track Confirmation	?	GPS Collar Data	CERTAIN
	~~Bennie~~	4	1	Confirmed	G	FWP camera observations, GPS collared wolves, rendezvous site not active, harvest	N	.	.
104	Teton	4	4	Confirmed	G	FWP Camera Observation	N	FWP General Knowledge	FAIRLY CERTAIN
105	Red Shale	4	6	Confirmed	M	FWP Camera Observation, FWP Howling Surveys, FWP Track Observations	?	Historic Collar data	FAIRLY CERTAIN
106	Pretty Prairie	4	7	Confirmed	G	FWP Camera Observations, FWP Track Confirmation	Y	FWP General Knowledge	FAIRLY CERTAIN
107	Crown Mountain	4	2	Confirmed	G	FWP Camera Observations	N	Historic Collar data	CERTAIN
108	Blowout Mountain	4	2	Confirmed	G	FWP Camera Observations, GPS Collared Wolf, FWP Confirmed Tracks	?	GPS Collar Data	CERTAIN

REF #	WOLF PACK	FWP REGION	MINIMUM PACK SIZE DEC 31, 2025	PACK COUNT TYPE Confirmed/Estimated/No Data	PACK COUNT QUALITY	PACK SIZE DATA TYPE	2025 BREEDING PAIR?	CENTROID TYPE	CENTROID QUALITY CODE
	~~Steamboat~~	4	0	Confirmed	G	FWP confirmed game camera observations, GPS collar locations, harvest	N	.	.
109	Iron Mtn	4	3	Confirmed	G	FWP Track Observations, FWP camera observations, Forest Service Reports	N	FWP General Knowledge	FAIRLY CERTAIN
	~~Deep Creek~~	4	0	Estimated	M	FWP camera observations, harvest	?	.	.
	Montana Totals		**468**						

APPENDIX 6

Overview of iPOM 2.0: Updates to Wolf Abundance Estimation in Montana

Technical Summary, June 2026

Sarah N. Sells[1], Hannah A. Sipe[2], Thomas Riecke[3], Justin Gude[4], Molly Parks[4], Kevin Podruzny[4], Wendy Cole[4], Nathan Lance[4], Tyler Parks[4], Matt Thorpe[4], and Sarah Zielke[4]

[1] U.S. Geological Survey, Montana Cooperative Wildlife Research Unit, University of Montana.
[2] Montana Cooperative Wildlife Research Unit, University of Montana.
[3] Wildlife Biology Program, University of Montana.
[4] Montana Fish, Wildlife and Parks.

Publication status: This technical summary has undergone U.S. Geological Survey peer review and approval. It summarizes preliminary iPOM 2.0 results available as of June 2026. Results remain subject to final model development, external peer review, and publication of the complete iPOM 2.0 framework.

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iPOM Overview

Montana Fish, Wildlife and Parks (MFWP) uses the integrated Patch Occupancy Model (iPOM) to estimate statewide and regional wolf abundance. During the early years of recovery, wolf abundance was tracked using minimum counts. As the population increased, limitations of this method became apparent, motivating development of a model-based approach for estimating abundance. iPOM development began in 2006, was operationalized in 2013, and has been used in its current form (iPOM 1.0) since 2021. Since its inception, iPOM has been developed and presented as an adaptive modeling framework intended to evolve as new data and analytical methods become available[1]. Here, we briefly present ongoing work to produce the next iteration of iPOM, hereafter iPOM 2.0, and summarize major model updates and resulting preliminary wolf abundance estimates.

iPOM uses models for occupancy, territory size, and pack size, along with monitoring data collected by MFWP wolf specialists and potential wolf sightings reported by deer and elk hunters during the 5-week general rifle season each Nov-Dec. These monitoring data, wolf sightings, and covariates for habitat and survey effort are used to model occupancy of packs on a statewide grid of 600-km^2 cells. The area used by wolves is then estimated as each cell's occupancy estimate multiplied by grid cell area. iPOM estimates pack abundance by dividing this area by predicted territory sizes, and in-pack wolf abundance by multiplying pack abundance by estimated group size. This is combined with a lone wolf rate to estimate total wolf abundance (see Sells et al.[1] for a full description of iPOM 1.0).

This technical summary provides a high-level overview of the proposed iPOM updates and their implications for wolf abundance estimates. The estimates presented here represent results as of June 2026 and are provided to inform upcoming discussions surrounding harvest management and regulations (e.g., season dates, quotas, methods). Results are preliminary and remain subject to final model refinement and peer review.

Key Changes in iPOM 2.0

Each major component of iPOM was revisited using updated data, revised methods, or both. The resulting changes are summarized below and illustrated in Figures 1 and 2.

Occupancy Model: This model had remained largely unchanged since its original development more than a decade ago[2–4]. Additional covariates and analytical methods provided an opportunity to revisit the occupancy model and evaluate additional model frameworks.

iPOM 1.0 combined multiple environmental covariates into a single index, which helped address correlation among habitat variables and simplified model structure. iPOM 2.0 incorporates an expanded suite of habitat and anthropogenic covariates, including environmental features (e.g., forest cover, riparian, habitat fragmentation) and human-related features (e.g., human disturbance, grazing allotments). iPOM 2.0 models these covariates individually, allowing the occupancy relationships to be modeled directly rather than through a composite index (Figures 1 & 2).

iPOM 2.0 also restructures the role of verified pack locations in occupancy estimation. Hunter observations continue to be treated as uncertain detections and both the original and revised approaches explicitly account for the potential for false hunter reports. In iPOM 1.0, verified pack locations functioned primarily as confirmatory information for hunter detections. In iPOM 2.0, verified pack locations contribute confirmed-presence information directly, with hunter observations providing additional uncertain detection information through a confirmed-presences framework (see Ferguson et al.[5] for model structure).

Territory Model: The territory model provides a suite of predicted territory sizes under different conditions, including different pack densities[6,7]. Because territory size is dynamic and can fluctuate with pack density as packs compete for space, a representation of local pack density is needed to identify realistic territory-size predictions for use in iPOM.

iPOM 1.0 and 2.0 both use the same underlying mechanistic territory model; updates are primarily related to how local pack density conditions are represented when selecting territory-size predictions. iPOM 1.0 relied on minimum pack counts each year at the ecoregional level[1]. iPOM 2.0 instead uses a local density cap based on recent iPOM-estimated pack abundance (mean from the prior 3 years) at the grid-cell level. Rather than selecting a single density level, iPOM 2.0 retains territory size predictions associated with that cap and lower density levels. This approach incorporates local variation in pack density and competition at the local grid-cell scale rather than the ecoregion level (Figures 1 & 2).

Comparison of predicted territory sizes with GPS-collar-based estimates from 99 wolf biological years (2008 – 2023, including 45 new territory estimates since previous analyses[7]) showed broad agreement. Predicted sizes averaged 500 km^2 compared to 543 km^2 for observed territories (95% quantile ranges: 305 – 958 km^2 for predicted and 155 – 1,177 km^2 for observed territory sizes). The modest difference between predicted and observed territory sizes is expected because the territory model partitions overlapping space among competing packs, whereas observed territory estimates include overlap among packs.

Group Size Model: iPOM 1.0 used a generalized linear mixed effects model (GLMM) for group size that was intentionally designed around data expected to remain available into the future[8]. iPOM 2.0 revises the original model as a Bayesian hierarchical GLMM with an updated, broader set of spatial and temporal covariates to represent habitat and human-related influence on pack size, including localized mortalities (Figures 1 & 2).

iPOM 2.0 expands the pack-size dataset used for model development and estimation. Whereas iPOM 1.0 relied on good-quality counts through 2018, iPOM 2.0 uses both good- and moderate-quality counts across all years (2007–2025). This incorporates additional observations collected since development of the original model. Use of moderate-quality counts was motivated by monitoring data collected after development of iPOM 1.0, which showed increasing differences between good- and moderate-quality count observations (Figure 3).

Evaluation of iPOM 2.0 group size predictions against annual pack size observations demonstrated agreement across count quality classes, validation periods, regions, and years. Overall, 37 – 58% of predictions (depending on validation period and count quality) were within ±1 wolf of good- and moderate-quality pack counts, with 89 – 95% of predictions within ±3 wolves. Under iPOM 1.0, corresponding values were 25–37% (±1 wolf) and 68–86% (±3 wolves).

Lone Wolf Rate: iPOM 1.0 accounted for lone and dispersing wolves using a literature-based rate of 1.125[9]. iPOM 2.0 instead uses a Montana-specific estimate based on GPS-collar data collected during the Nov–Dec observation period. The resulting rate (1.11) is slightly lower than the literature-based rate while incorporating substantially greater uncertainty to reflect observed variation in dispersal rates among collared wolves (Figure 1).

Model Development Timeline

Many of the updates described here have been under development for multiple years and reflect the iterative nature of scientific model development. Several model components were explicitly identified for future refinement when iPOM was originally published, reflecting the expectation that additional data and analytical developments would become available through time[1]. The revisions described here are part of that planned model development process. Preliminary results from iPOM 2.0 became available in recent months, prompting this technical summary. Remaining steps involve final model selection, peer review, and publication of the complete iPOM 2.0 framework.

Preliminary Results

Results for iPOM 1.0 and 2.0 are displayed in Figure 4. For 2025, iPOM 1.0 estimated an occupied area of 66,134 km^2 (95% uncertainty interval: 61,715 – 71,170 km^2), with 181 packs (165 – 200), and 1,094 wolves (991 – 1,211).

iPOM 2.0 estimated an occupied area of 63,547 km^2 (54,720 – 72,286 km^2), with 155 packs (132 – 178), and 725 wolves (618 – 836). These estimates show declines from the 2013 peak estimated abundance of 1,118 wolves (973 – 1,269) and the 2021 estimate of 932 wolves (796 – 1,073). Accordingly, within the iPOM 2.0 framework, estimated wolf abundance declined by approximately 35% from the 2013 peak and 22% from 2021 to 2025.

Although both models estimate the same underlying wolf population, differences in model structure, data inputs, assumptions, and estimation methods produced different abundance estimates and associated uncertainty intervals. Estimates and uncertainty intervals quantify uncertainty within a particular modeling framework and therefore should not be interpreted as directly comparable across frameworks.

More details and full results will be provided following completion of model development and publication of the iPOM 2.0 framework. In the interim, these preliminary results provide updated abundance estimates based on the current iPOM 2.0 framework and may help inform upcoming discussions around wolf harvest management and regulations.

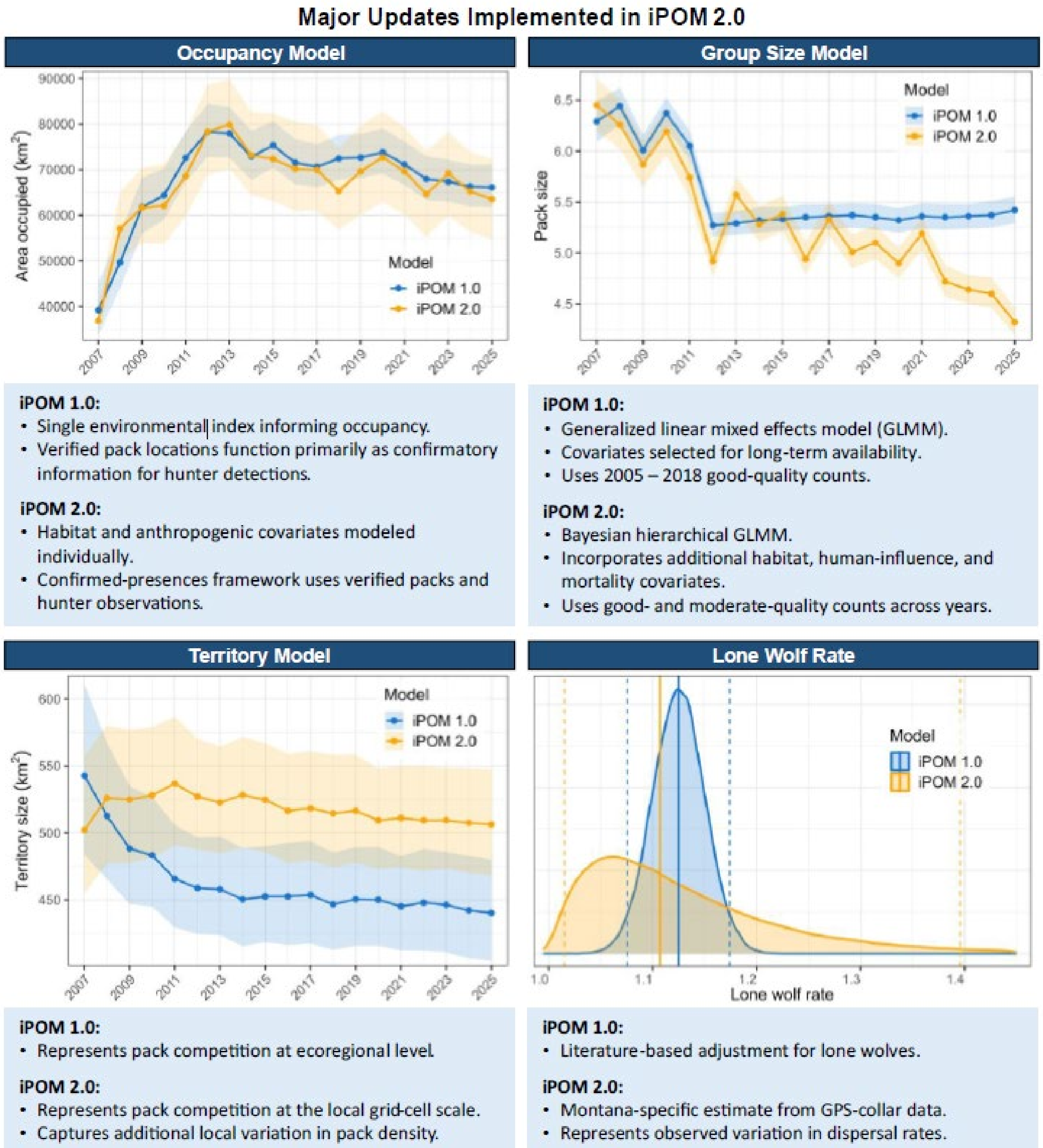

Figure 1. Summary of major changes implemented in iPOM 2.0. Panels compare key components of iPOM 1.0 and iPOM 2.0, including updates to the occupancy, territory size, group size, and lone wolf components of the model. Lines represent annual median estimates. Occupancy ribbons represent 95% uncertainty intervals from statewide model estimates. Territory size and group size ribbons represent 95% uncertainty intervals around estimated annual mean values for higher-occupancy grid cells. In the lone wolf rate panel, density curves show the distributions of input values, with solid and dashed vertical lines indicating median values and 95% intervals, respectively.

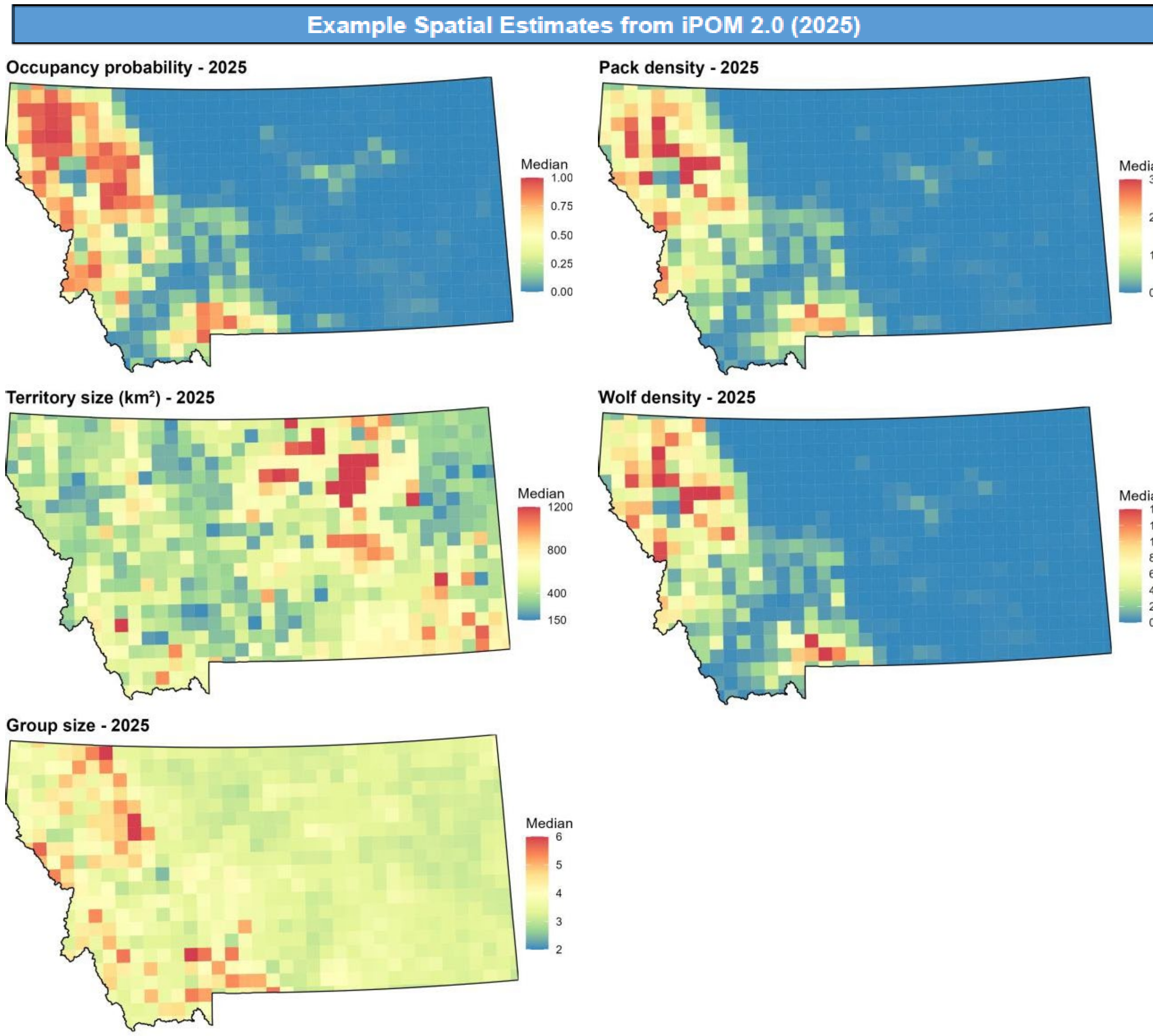

Figure 2. Preliminary estimates from iPOM 2.0 for 2025. Maps show median estimates of occupancy probability, territory size, group size, pack density, and wolf density at the 600-km² grid-cell scale.

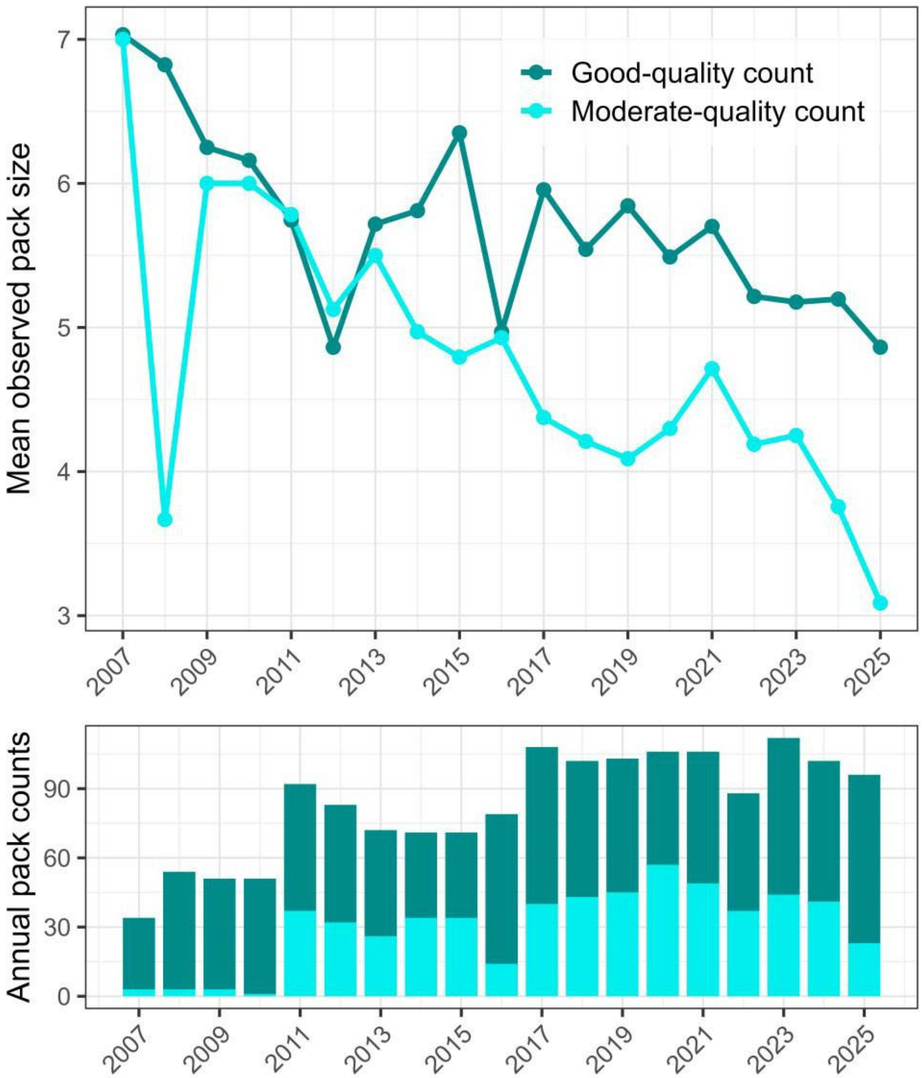

Figure 3. Mean observed pack sizes from good- and moderate-quality count observations (top panel) and the annual number of observations contributing to each count-quality class (bottom panel). Mean pack sizes from good- and moderate-quality observations were generally similar during the period used to develop the original iPOM 1.0 group-size model (through 2018) but diverged in more recent years. At the same time, moderate-quality counts became an increasingly important component of the available dataset. Together, these patterns motivated re-evaluation of the iPOM 1.0 inputs and inclusion of moderate-quality counts in iPOM 2.0.

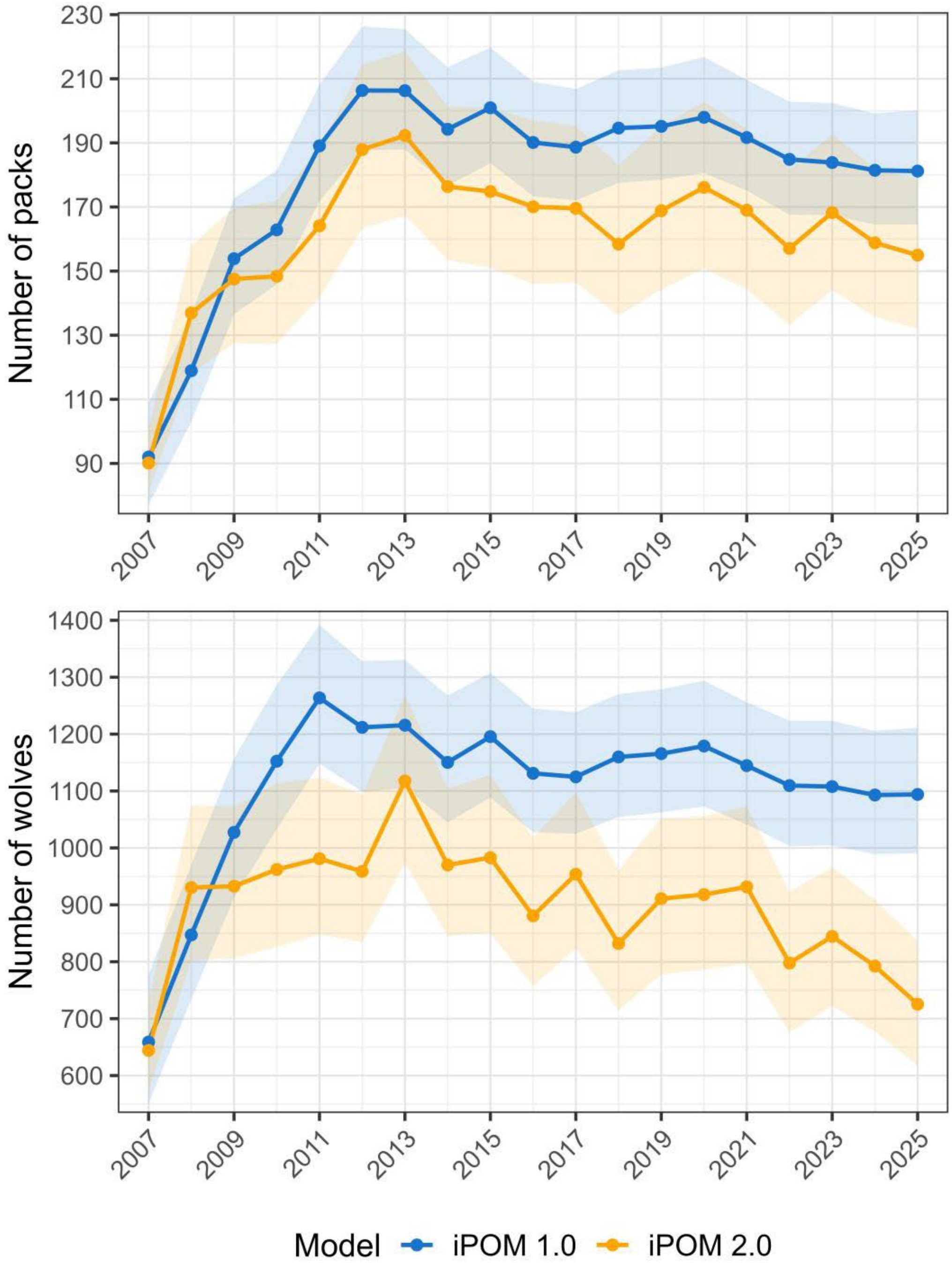

Figure 4. Preliminary estimates of pack and wolf abundance in Montana from iPOM 2.0 (orange) and iPOM 1.0 (blue), 2007–2025. Lines show annual median estimates and shaded ribbons show 95% uncertainty intervals.

Acknowledgments

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