

**IDAHO DEPARTMENT OF FISH AND GAME**

**Ed Schriever, Director**

**Surveys and Inventories**

**Statewide Report**



**WOLF**

July 1, 2018 to June 30, 2019

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## STATEWIDE REPORT SURVEYS AND INVENTORY

**JOB TITLE:** Wolf Surveys and Inventories  
**STUDY NAME:** Wolf Population Status and Trend Studies  
**PERIOD COVERED:** July 1, 2018 to June 30, 2019

### Statewide

During Calendar Year 2018, Idaho Department of Fish and Game (IDFG) sold 43,224 wolf tags, including 42,823 hunting tags and 401 trapping tags. This number includes hunting and trapping tags purchased individually and those wolf hunting tags included in the Sportsman's Package. It is unknown how many of the individuals who purchased tags hunted specifically for wolves.

The Idaho Fish and Game Commission adopted some significant changes to wolf seasons during the reporting period for the 2019 Big Game Season.

- Expanded wolf hunting seasons by 1 month to end April 30 in 48 Game Management Units (GMU) in southern Idaho that have a spring black bear season.
- Added new trapping season in GMUs 32A and 33.
- Opened trapping season 45 days earlier from November 15 to open October 1 in 10 GMUs.

Through 2015 wolf monitoring data were summarized on a calendar year (CY) basis for monitoring relative to delisting criteria. However, with initiation of harvest seasons, it became more useful to shift summaries to a biological year (BY) basis, starting with the birth pulse (approximately May 1). This allowed a more informative interpretation of the harvest characteristics and impacts on the wolf population. Unless otherwise stated, harvest data in this report are summarized on a BY basis, May 1– April 30. Biological Year (BY) 2018 runs May 1, 2018 to April 30, 2019. Hunters are required to report harvest of a wolf within 10 days of kill. Most wolf hunting harvest occurs incidentally during elk and deer hunting seasons. Harvest increased slightly during this reporting period compared to the past three years (4% over the past 3 year period).

### Management Objectives

Wolves are currently managed under the 2002 *Idaho Wolf Conservation and Management Plan* (2002 Wolf Plan) and are classified as a big game animal. Harvest has been authorized by the Fish and Game Commission by hunting since 2009 and by trapping since 2011. See link for the 2002 Wolf Plan: <https://idfg.idaho.gov/old-web/docs/wolves/plan02.pdf>.

Idaho Department of Fish and Game's goal is to manage wolves to reduce conflicts, ensure a self-sustaining wolf population, balance with other big game species and maintain state management authority. Idaho Department of Fish and Game will monitor mandatory reporting and check-in data, as well as other sources of wolf mortality and monitoring data, to ensure

harvest does not cause the population to approach the 15 wolf pack delisting criteria. Seasons and areas can be restricted or closed if mortality is determined to be excessive.

## **Monitoring**

Until May 2016, wolf monitoring was focused on assessing population characteristics relative to ESA delisting criteria. Since then monitoring has been intended to assess the population relative to criteria in the 2002 Wolf Plan and to inform harvest and other management decisions.

Where wolf densities are high, management need not be very restrictive, and population monitoring may be limited to evaluating broad-scale population changes. Most monitoring tools can be used at different levels of intensity, but practical and financial considerations typically dictate the extent to which a given tool is used.

## **Population Surveys and Monitoring**

The 2002 Wolf Plan identified a wolf population of more than 15 packs as a criteria for wolf management, depredation control, and monitoring. Below 15 packs, monitoring would be heavily reliant upon radio-collaring. When more than 15 packs are present, monitoring will primarily be by indirect management indicators using a variety of population monitoring tools (Idaho Legislative Wolf Oversight Committee 2002). There have been 15 or more packs documented in Idaho since 2003.

## **Available Monitoring Tools**

Several monitoring tools were used during the reporting period to provide insight into Idaho's wolf population including:

1. A statewide array of remote cameras to document distribution, pack demographics, and wolf abundance in an occupancy-abundance model framework (Ausband et al. 2014, IDFG Unpublished Report);
2. A minimum number of reproductive packs by genetic identification of individuals through DNA samples of harvested wolves (Stansbury et al. 2014);
3. A mandatory, physical check of all harvested wolves to help determine population composition and distribution;
4. Incidental observations of wolves by members of the public to help determine distribution;
5. Direct observation during big game aerial survey flights;
6. Monitoring of livestock depredations and lethal control actions authorized by IDFG; and,
7. Radio-collared wolves.

## **Capture, Radio-mark and or Telemetry**

Thirteen wolves fitted with GPS radio collars were being monitored at the start of BY2018. Eleven wolves were captured and radio-collared during the report period. Four wolves were captured and radio-collared by IDFG in the Lolo Elk Zone to assist in wolf removals under the Lolo Predation Management Plan. Seven wolves were radio-collared by USDA Wildlife Services under authorization by IDFG to assist in wolf removals to address livestock depredations. Eight collared wolves remained available for monitoring at the end of the BY2018 (Table 1). Eleven collars had unknown fates; either lost tracking due to collar failure or destroyed (45% of the radio-collars during the BY).

## **Wolf Distribution and Monitoring**

From 2009 to 2019, wolf distribution was monitored through multiple data sources and occupancy models based on non-invasive genetic sampling in predicted rendezvous site habitat, locations of radio-collared wolves, and covariates such as slope, elevation, forest cover and livestock density.

### *Statewide Occupancy*

Wolf population trend can be measured using measures of occupancy over time. During summer 2018, IDFG systematically surveyed wolf habitat for wolf presence north of the Snake River Plain with remote cameras to improve wolf occupancy models. This portion of the state was divided into 222 grid cells of 686 km<sup>2</sup> (approximating the size of an average wolf territory in Idaho). One remote camera was placed in modeled predicted wolf habitat within each cell (Figure 1). Cameras were deployed by July 1 and retrieved after September 30. IDFG personnel also deployed 209 cameras along roads and trails within 500 m of predicted wolf rendezvous site habitat in each non-wilderness cell. In these units, covariates were used for modeling occupancy included livestock density, forest cover, slope elevation, elk density and proximity to occupied cells. Cameras yielded 2,576 images of wolves. The 2018 cameras yielded the highest number of wolf photos, but 63% of images captured were from just 15 cameras.

The most supported model considered for predicating 2018 wolf occupancy contained livestock density and neighboring cells occupied by wolves (IDFG Ausband unpublished Report, 2018). The probability of detection was most affected by the amount of predicted rendezvous site habitat in the cell. Wolves were well-distributed across Idaho during summer 2016 to 2018 (Figure 2). From 2016 to 2018, estimated 40-45% of predicted wolf habitat is occupied. Occupancy was lowest in the Southeast Region (1%) and highest in the Panhandle (68%) in 2018.

We also calculated the number of packs in the state using a patch occupancy methods. The 2018 naïve occupancy (one, overall estimate of occupancy accounting for imperfect detection and cells not sampled) of wolves statewide was estimated to be 40.7% (SE ± 0.04). Following Ausband et al. (2014), the average wolf pack territory size (686 km<sup>2</sup>) was multiplied by the total number of cells, then multiplied by the naïve occupancy estimate (0.407), providing a total area estimated to be occupied by wolves in Idaho (61,982 km<sup>2</sup>). The total area was then divided by the grid cell size (average territorial size 686 km<sup>2</sup>), estimating a total of 97 packs (Table 2). Regional estimates of occupancy using images from camera surveys did not appear to change significantly over the last three years.

### *Statewide abundance estimate with high intensity camera grid*

To expand upon occupancy modeling efforts developed by IDFG research staff, we propose a more intensive trail camera effort to examine the feasibility of using remotely triggered cameras as a data source for estimating wolf abundance, to use in tandem with multiple data streams (e.g., DNA from harvest) for an Integrated Population Model. Newly developed time-to-event (TTE) and space-to-event (STE) models show promise for estimating abundance of rare animals (Moeller et al. 2018).

To account for the variability of wolf density throughout the state, sampling effort was needed from high to low density areas. Three strata (high, medium, and low) were created from the

mean estimates of wolf occupancy; in other words, each state cell was assigned a low, medium or high stratum. Within 37 cells (26,200 meters resolution), we created a grid of 16 smaller, focal cells that are much higher in resolution (6,550 meters) (Figure 3). Simulations on IDFG wolf trail camera data suggest approximately 600 trail cameras would be needed to estimate statewide wolf abundance. Due to the differences in needed sampling intensity across the strata, we would allocate 20% to high strata, 30% to medium, and 50% of the cameras to low. Low density areas need more cameras to obtain sufficient wolf detections.

#### Minimum number or reproductive packs.

In 2018 DNA was collected at rendezvous sites and from harvested wolves to provide a minimum count of gray wolf reproductive packs through reconstruction of sibling groups among harvested young of the year. Genotypes were generated using nuclear DNA microsatellite loci (Stansbury, et al., 2014) for individuals designated as young of the year (YOY) through tooth analysis. These assignments were based on genotyped tissue samples from wolf samples previously collected in Idaho. Full sibling relationships will be reconstructed using Colony2 software. Data from BY2017 is currently being analyzed. Analyses from previous years produced counts of sibgroups among harvested YOY: 49 for 2014, 55 for 2015, and 39 for 2016.

In summary, the combination of several techniques, including rendezvous population estimates, occupancy modeling, high density camera grids, along with supporting data such as litter size and DNA harvest estimates, can produce reliable annual estimates of wolf population dynamics from camera surveys.

## **Hunting, Trapping, and Harvest Characteristics**

### **Seasons**

Hunting seasons vary across the state depending on management objectives and social considerations. To further address chronic livestock conflicts, hunting seasons opened year-round on private land in Units 22, 24, 31, all units in Salmon Region, and that portion of Units 50 and 51 in Custer County.

Most wolf trapping seasons were open November 15-March 31. Wolf trapping seasons were opened Oct 10 – Mar 31 throughout southern Idaho on private land only in 28 units, excluding units 48 and 49. New wolf trapping seasons in Units 8, 8A, 11, 11A, 31, 32, 34, and 35. An earlier opening date of October 10 was implemented to help address elk management conflicts in these GMUs.

Both foothold traps and snares were legal for trapping wolves, with some regulation restrictions on configurations. Most trapping seasons now open Oct 10 instead of Nov 15, except in Units 1, 60, 61, 62, and 62A where grizzly bears may be encountered.

### **Bag Limits**

Individuals could harvest up to five wolves with hunting tags per calendar year and five wolves with trapping tags. However, in units in Panhandle, Clearwater, Upper Snake, and Salmon Regions, the annual bag limit increased from 5 to 10 wolf hunting tags and certified trappers could also purchase up to 10 trapping tags per trapping season (valid July 1 – June 30 rather than

for a calendar year). Wolf hunting tags are also valid for trapped wolves. Despite bag limits allowing multiple wolves, few individuals take more than one in a year.

## **Harvest**

Hunters and trappers are required to present the hide and skull of all harvested wolves to IDFG. The required check of harvested wolves provides detailed harvest information for management. During BY2018, hunters and trappers took 313 wolves, 12% above the previous three-year average (Table 3). During BY2018, trappers took 127 wolves, 10% above the previous three-year average and hunters took 186 wolves, 13% above the previous three-year average.

Wolf harvest density (number of wolves harvested per 100 square miles) is greatest in the northern half of the state, particularly in well-roaded areas close to population centers (Figure 4). Wolf mortality density is greatest in areas that are well-roaded and experience higher livestock depredations (mortality categories submitted in BGMRs; i.e., harvest, predator control, wildlife services, road kill) (Figure 5). Wolf harvest combined among the Panhandle, Clearwater, and Southwest Regions comprised 70-80% of the total statewide harvest during BYs 2016-2018. Wolf harvest density provides information on relative differences between units for harvest, but provides no information as to differences in harvest rates between units.

Genetic samples from wolves harvested during the BY2018 are currently being analyzed to compare to DNA samples collected from rendezvous site surveys to determine harvest rates in five game management units from three study areas including units 4, 28, and 33-35 (Ausband et al. 2010, D. Ausband. 2018). During both BY2016 and BY2017, genotypes were established from scat and hair samples collected at rendezvous sites and analyzed at the University of Idaho genetics lab. Results from BY2016 estimated (pooled) 11.2% of the animals sampled were harvested during the hunting season in these units, less than half the rate of human-caused mortality suggested to be necessary to reduce a wolf population (Adams et al. 2008). Results from BY2017 showed that 25.5% of the wolves we collected scat from in summer 2017 ended up in harvest that following fall/winter. These rates pertain only to these units. Percentage of wolves that was harvested in other units is unknown.

## **Wolf Depredation on Livestock**

Management to reduce wolf depredation on livestock remains a top priority. Livestock depredations occur largely southward and eastward of the lower Clearwater to Island Park (Figure 6). Scarcity of depredations in central and northern Idaho is associated with a lack of significant livestock grazing. The scarcity of wolf caused livestock depredations south of the Snake River Plain in southern Idaho is associated with minimal wolf activity.

During CY 2018, USDA APHIS Wildlife Services recorded 214 confirmed and probable depredation incidents of domestic animals, almost double the number of incidents from 2015 and 2016 (Table 4). Cattle were associated with 109 reports (78%), sheep with 29 reports (21%), and other animals with 1 report (1%). A total of 319 confirmed and probable livestock deaths were wolf-caused. Of those, 133 were cattle mortalities and 182 were sheep mortalities (Table 5). During CY2018, 66 wolves were killed in response to livestock depredations or were killed by livestock producers/landowners in defense of property.

## **Wolf Predation**

Management of predation is an important priority for IDFG (Idaho Department of Fish and Game 2014). The impact of wolf predation on ungulate populations varies with the species of prey, their abundance and recent population trends, the type and abundance of other predators, and the types and abundance of other prey. Across the state, 774 radio-collared elk were monitored throughout the winter. Adult cow survival was 96% and calf survival was 69%. Leading cause of mortality for both adult cow elk and calves was mountain lions (Idaho Department of Fish and Game, Elk Statewide Report FY2019).

From May 2018 through April 2019, 7 wolves were killed to address wolf predation on elk in the Lolo Elk Zone under the guidance of the Lolo Predation Management Plan.

## **Management Discussion**

As wolf population monitoring needs have shifted from federal delisting needs to state management needs, IDFG has shifted its wolf monitoring focus from telemetry-based methods to methods based on remote cameras and DNA from wolf scats as well as harvest data. Occupancy modeling, genetic analyses, and wolf harvest patterns indicate wolves remain well-distributed and self-sustaining within the state.

Conflict resolution remains a top agency priority. Wolf depredations on livestock will likely remain a difficult issue wherever distributions of wolves and livestock overlap. Some relief can be obtained through measures to reduce wolf-livestock interactions through harvest, focused wolf control, changes to animal husbandry practices, and through measures that discourage wolf presence. USDA Wildlife Service agents are now radio-collaring wolves in high depredation areas under IDFG oversight.

## Literature Cited

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## Tables

**Table 1.** Status of radio-collared wolves during BY2018 (May 1, 2018 – Apr 30, 2019).

Time Period	Collared wolves	Fate at end of BY2018						
		Harvested		Depredation Kill (Livestock)	Dispersed from Idaho	Unknown mortality	Unknown fate (lost tracking)	Alive
		Hunting	Trapping					
Available at start of BY2018	13	1	0	1	0	1	10	0
Collared during BY 2018	11	0	0	2	0	0	1	8

**Table 2.** Number of wolf packs (95% CI) estimated from an occupancy model using images of wolves captured at camera traps in Idaho, summers 2016, 2017 and 2018. The number of estimated packs is the sum of the occupancy estimates for each cell sampled by a region and assumes grid cell size equals wolf pack territory size.

Region	2016	2017	2018
1	16.7 (13.3 – 19.9)	20.7 (17.3 – 23.4)	22.5 (18.5 – 25.6)
2	22.8 (18.9 – 26.9)	26.9 (22.6 – 31.0)	25.8 (22.0 – 29.6)
3 McCall	9.3 (7.6 – 11.2)	10.5 (8.8 – 12.3)	10.5 (8.8 – 12.2)
3 Nampa	9.1 (6.7 – 12.3)	9.9 (7.9 – 12.2)	10.9 (8.5 – 13.6)
4	4.9 (3.5 - 6.8)	3.9 (2.8 – 5.5)	4.7 (3.4 – 6.5)
5	0.8 (0.4 – 1.7)	0.4 (0.2 – 0.9)	0.4 (0.2 – 1.0)
6	10.3 (7.6 – 14.0)	9.7 (7.3 – 13.1)	9.5 (7.0 – 13.1)
7	14.0 (10.9 – 17.2)	14.8 (11.9 – 17.9)	16.2 (12.7 – 19.6)
<b>Idaho total</b>	<b>87.9 (69.0 – 109.9)</b>	<b>96.8 (78.7 – 116.2)</b>	<b>100.5 (81.1 – 121.2)</b>

**Table 3.** Idaho wolf harvest, BY2010 - BY2018 (BY: May 1 – Apr 30).

<b>Harvest Type</b>	<b>BY2010</b>	<b>BY2011</b>	<b>BY2012</b>	<b>BY2013</b>	<b>BY2014</b>	<b>BY2015</b>	<b>BY2016</b>	<b>BY2017</b>	<b>BY2018</b>
General Season Harvest	0	376	316	291	258	272	233	331	313
Predator Control	0	22	6	34	21	20	0	9	7
Depredation Kill	13	13	4	13	5	1	2	13	2
Wildlife Services	37	56	42	70	35	63	54	62	61
Other	9	26	13	16	13	23	8	11	4
Unknown	19	13	6	17	17	8	6	1	1
<b>Total</b>	<b>78</b>	<b>506</b>	<b>387</b>	<b>441</b>	<b>349</b>	<b>387</b>	<b>303</b>	<b>427</b>	<b>388</b>

General Season Harvest: General hunting and trapping harvest.

Predator Control: wolves harvested to address elk populations below objectives.

Depredation Kills: A landowners harvests a wolf protecting their property.

Wildlife Services: Control actions implemented after a confirmed livestock deprecations that resulted in a harvested wolf

Other: includes capture mortality, illegal kill, road kill, pick up and other minimal harvest categories.

**Table 4.** Probable and confirmed wolf-caused livestock depredation incidents in Idaho, CY2015 - CY2018.

<b>Livestock Affected (# Incidents)</b>	<b>Year</b>				
	<b>2014</b>	<b>2015</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>
Cattle	57	44	60	109	173
Dog	3	4	3	1	4
Domestic Bison	0	0	0	0	0
Goat	0	0	0	0	1
Llama	0	0	0	0	2
Horse	2	2	0	0	1
Sheep	24	21	13	29	33
<b>Grand Total</b>	<b>86</b>	<b>71</b>	<b>76</b>	<b>139</b>	<b>214</b>

**Table 5.** Probable and confirmed wolf-caused livestock deaths in Idaho, CY2015 - CY2018.

<b>Livestock Affected (# Animals)</b>	<b>Year</b>				
	<b>2014</b>	<b>2015</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>
Cattle	53	44	86	133	225
Dog	4	3	9	3	8
Domestic Bison		0	0	0	0
Goat		0	0	0	1
Llama		0	0	0	3
Horse	1	1	1	1	2
Sheep	107	134	93	182	243
<b>Grand Total</b>	<b>165</b>	<b>182</b>	<b>189</b>	<b>319</b>	<b>482</b>

# Figures

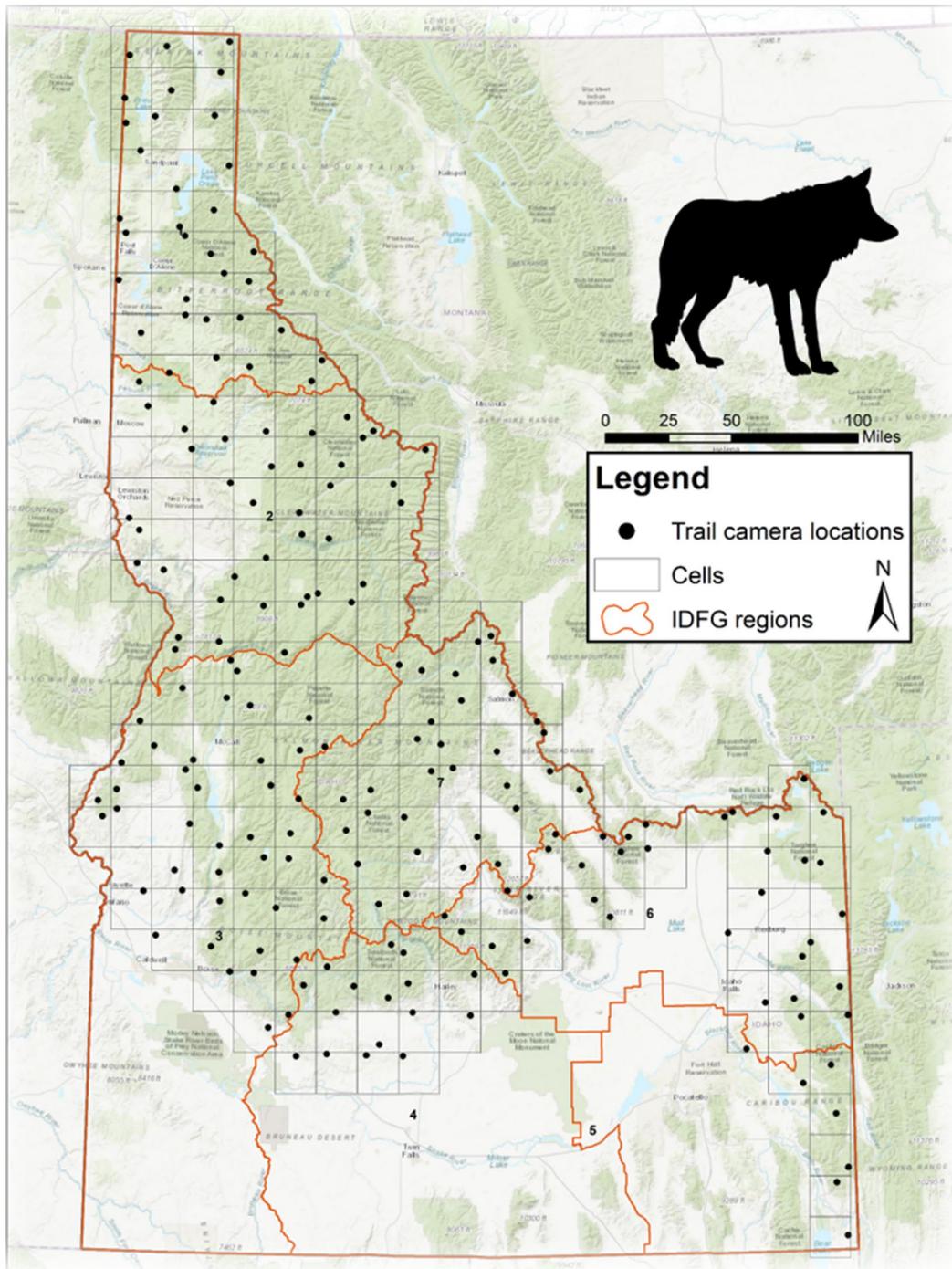


Figure 1. Sampling grid and remote camera locations used for 2018 occupancy modeling.

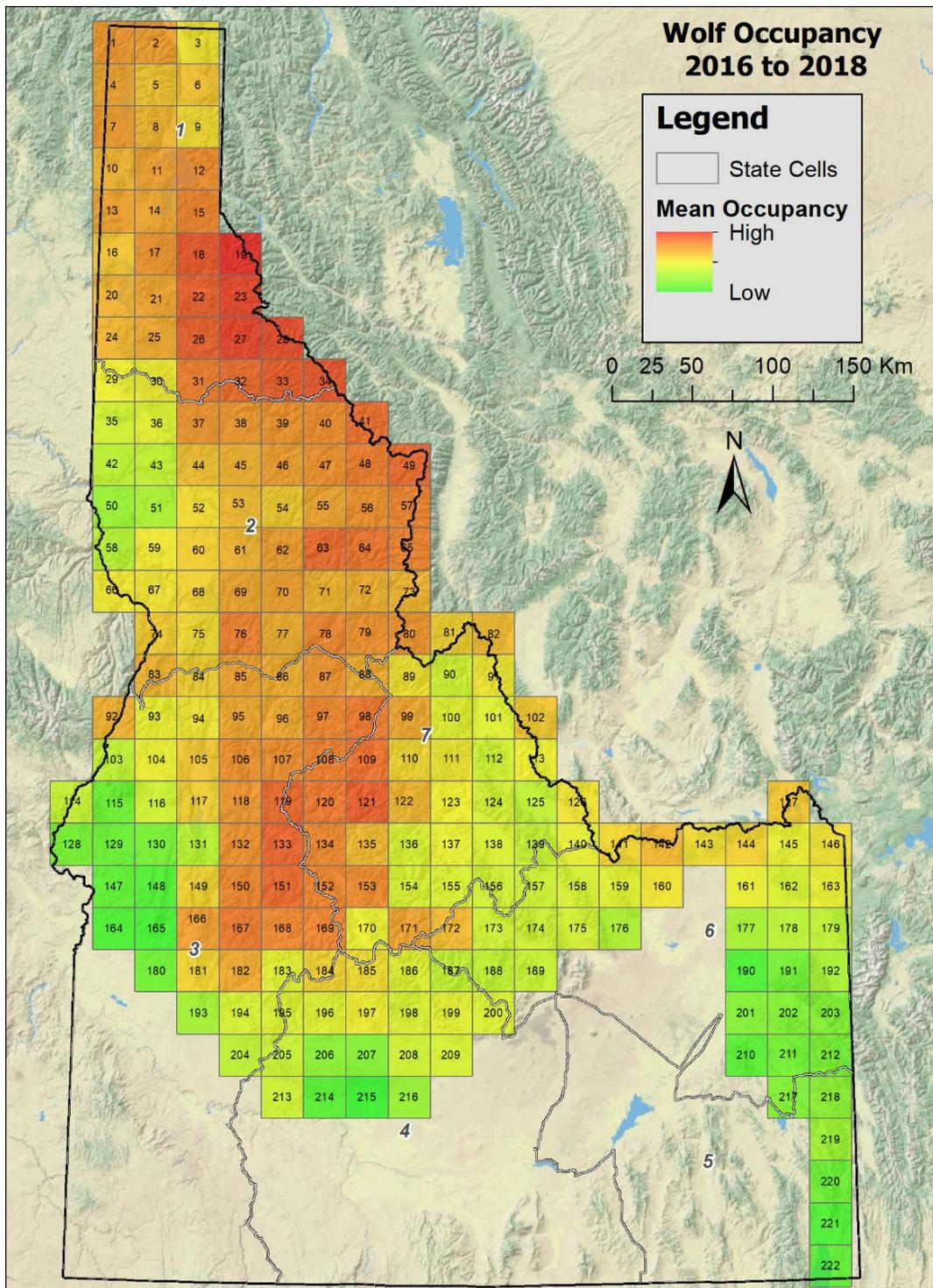


Figure 2. Mean wolf occupancy estimates per cell during summers 2016-2018. (Estimated conditional wolf occupancy from a model using images of wolves captured at camera traps in Idaho. Conditional occupancy defines any cell with a wolf detection as occupied. Occupancy is then estimated only for the remaining cells without wolf detections.

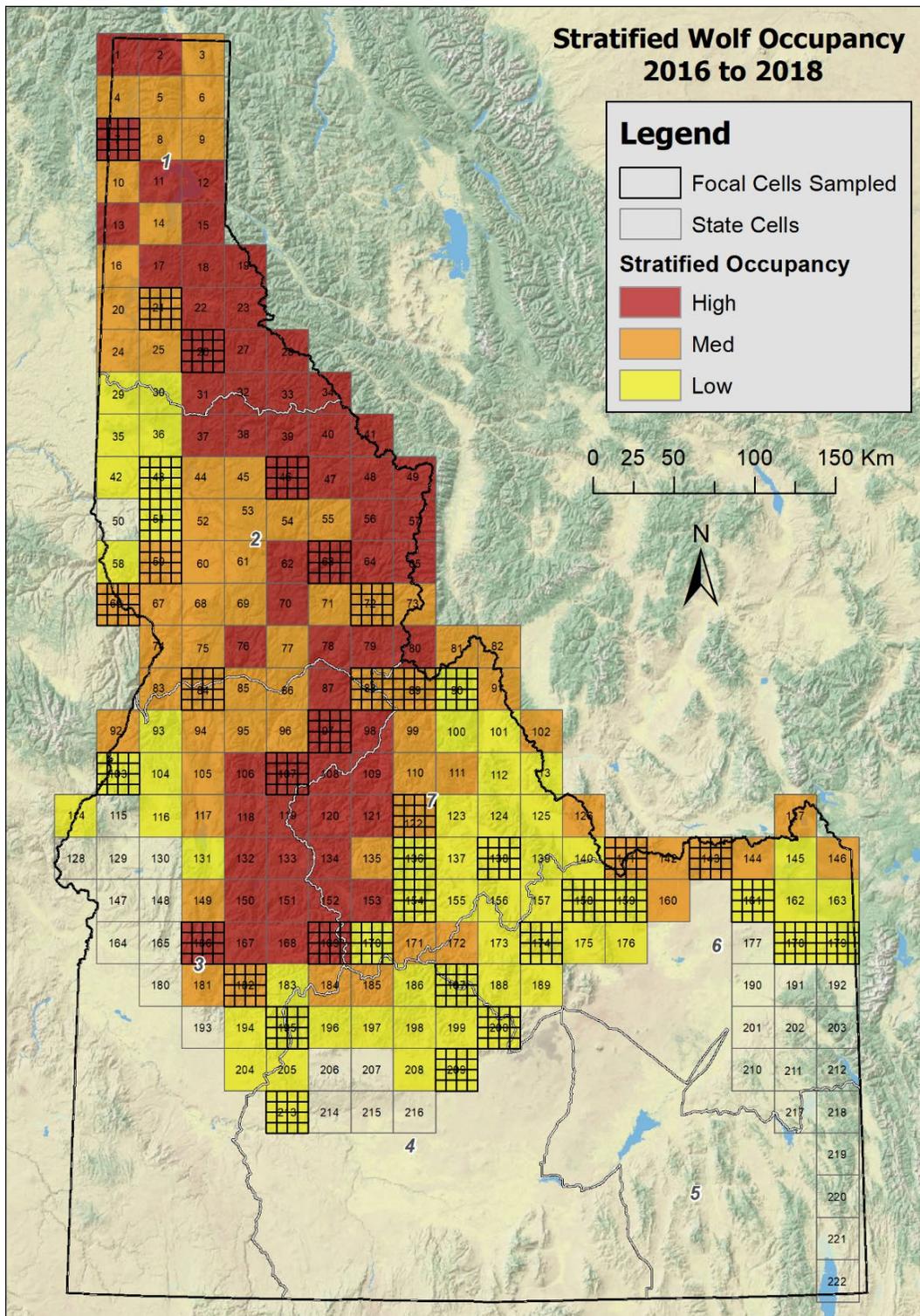


Figure 3. Example of stratified random sampling with focal cells nested within selected state cells. There are 16 focal cells within each state cell.

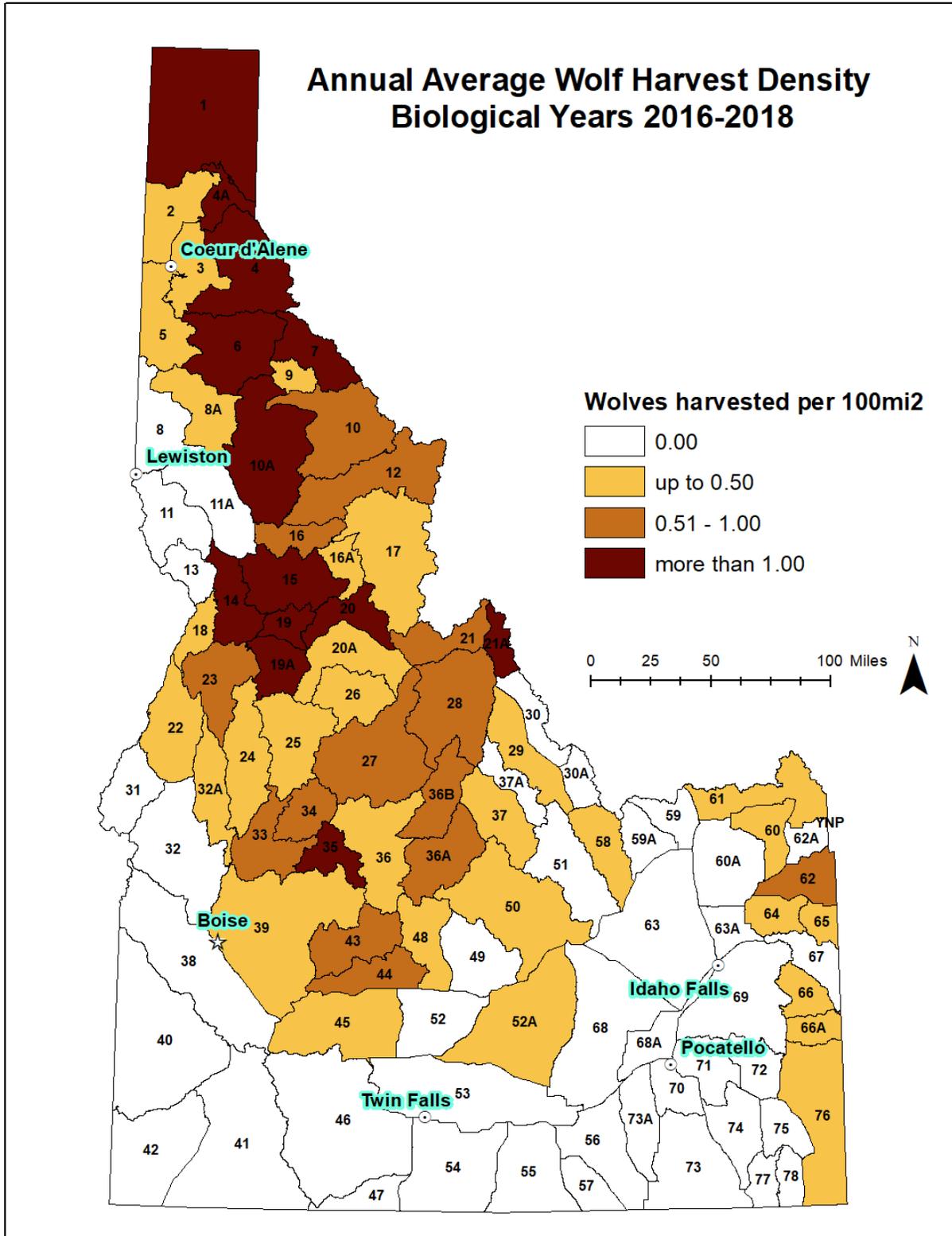


Figure 4. Distribution of wolf harvest (hunting and trapping) by the total of wolves harvested per 100 mi<sup>2</sup> (in each Game Management Unit) BY2016-2018 average.

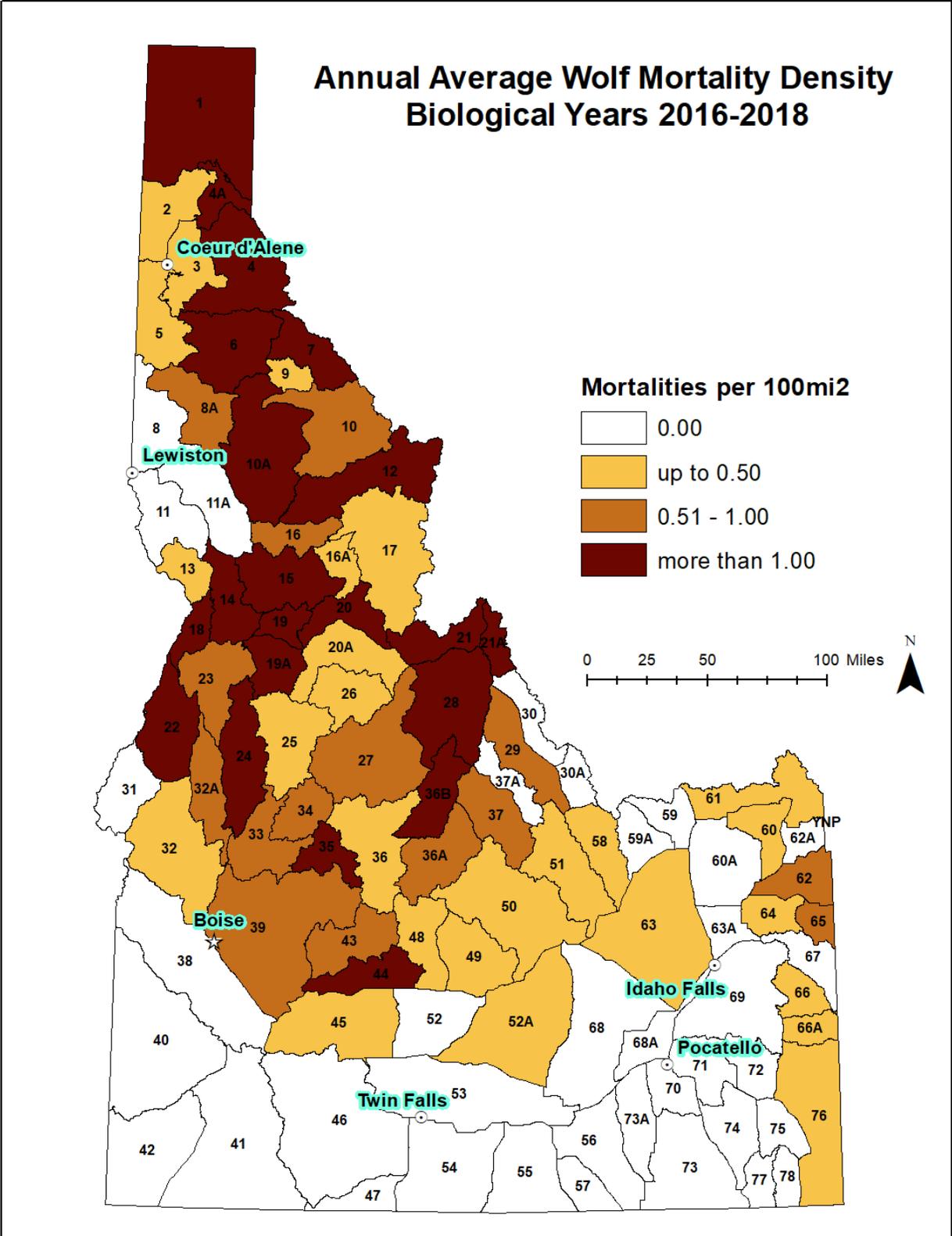


Figure 5. Average annual density of all detected wolf mortalities (i.e. control action, harvest, road kill), by the total of wolves harvested per 100 mi<sup>2</sup> through BY2016-2018, by Game Management Unit.

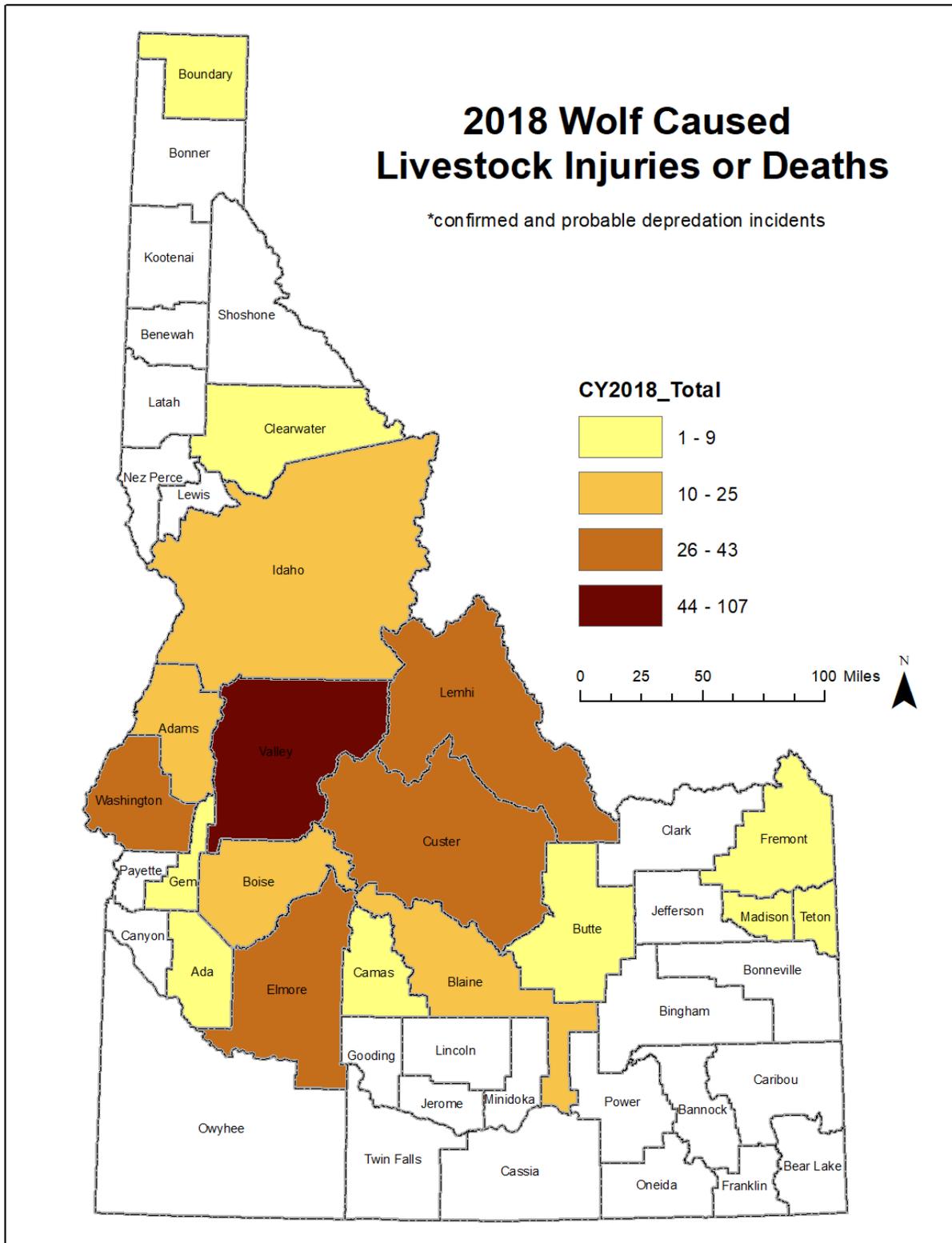


Figure 6. Total Wildlife Services confirmed and probable wolf-cause livestock mortalities for CY2018, by Idaho County.