Species Management Report and Plan ADF&G/DWC/SMR&P–2025–15

Wolf Management Report and Plan, Game Management Unit 24:

Report Period 1 July 2015–30 June 2020, and

Plan Period 1 July 2020–30 June 2025

Glenn W. Stout

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Alaska Department of Fish and Game Division of Wildlife Conservation

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Species management reports and plans provide information about species that are hunted or trapped and management actions, goals, recommendations for those species, and plans for data collection. Detailed information is prepared for each species every 5 years by the area management biologist for game management units in their areas, who also develops a plan for data collection and species management for the next 5 years. This type of report is not produced for species that are not managed for hunting or trapping or for areas where there is no current or anticipated activity. Unit reports are reviewed and approved for publication by regional management coordinators and are available to the public via the Alaska Department of Fish and Game's public website.

This species management report and plan was reviewed and approved for publication by Jason Caikoski, Management Coordinator for Region III for the Division of Wildlife Conservation.

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Please contact the authors or the Division of Wildlife Conservation at (907) 465-4190 if you have questions about the content of this report.

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Purpose of this Report

This report provides a record of survey and inventory management activities for wolf (*Canis lupus*) in Unit 24 for the 5 regulatory years 2015–2019 and plans for survey and inventory management activities in the following 5 regulatory years, 2020–2024. However, the report may include data from additional years at the discretion of the author. A regulatory year (RY) begins 1 July and ends 30 June (e.g., RY15 = 1 July 2015–30 June 2016). This report is produced primarily to provide agency staff with data and analysis to help guide and record agency efforts but is also provided to the public to inform it of wildlife management activities. In 2016 the Alaska Department of Fish and Game's (ADF&G, the department) Division of Wildlife Conservation (DWC) launched this 5-year report to more efficiently report on trends and to describe potential changes in data collection activities over the next 5 years. It replaces the moose management report of survey and inventory activities that was previously produced every 3 years.

I. RY15–RY19 Management Report

Management Area

Unit 24 (26,068 mi^2) is located in western Interior Alaska and encompasses the Koyukuk River drainage upstream of the Dulbi River drainage. Portions of 4 ecoregions found in Unit 24 include the Brooks Range, Ray Mountains, Kobuk Ridges, and Yukon River lowlands[1].

Summary of Status, Trend, Management Activities, and History of Wolves in Unit 24

Wolves are present throughout Unit 24, but population size has fluctuated historically due to prey availability and wolf control activities. Because the number of wolves varies depending on availability of prey, there are more wolves in southern (Unit 24D) and northern (Brooks Range portion of Units 24A and 24B) Unit 24 than in central Unit 24 (remainder), which has low moose (*Alces alces*) densities and more sporadic movements of caribou (*Rangifer tarandus*).

During the late 1800s, wolf abundance in the Brooks Range was low because densities of moose, caribou, and Dall sheep (*Ovis dalli*) were similarly low (Campbell 1974). During the early 1900s, throughout Unit 24, prey populations increased, leading to increases in wolf numbers. Moose populations rapidly increased in the 1940s and 1950s, coincident with federal wolf control. When wolf control ceased in the late 1950s, the abundance of moose allowed wolf numbers to increase (Woolington 1997). Demand for wolf hides was high in the late 1970s and 1980s, and regulations allowed land-and-shoot hunting of wolves, which resulted in high levels of wolf harvest. Moose densities increased throughout Unit 24 during that period and likely followed trends similar to those observed throughout other regions in Alaska following the repeal of land-and-shoot wolf hunting regulations in 1991 (Regelin et al. 2005).

[1] Maps for Unit 24 boundaries and special management areas are found at http://www.adfg.alaska.gov/index.cfm?adfg=maps.main.

Adams et al. (2008) reported on wolf population dynamics and harvest patterns in the central Brooks Range of northern Units 24A and 24B during 1987–1991. They found that wolf densities averaged 17.1 wolves/1,000 mi^2 (6.6/1,000 km^2) in autumn, and annual harvest removed an estimated 12% of the population. However, during their study period, the wolf population compensated for <29% of human harvest primarily by adjusting their individual dispersal.

An intensive management (IM) program was conducted during RY12–RY17 with the primary objective of increasing moose abundance in a 1,360 mi^2 portion of Unit 24B, sometimes referred to as the Upper Koyukuk Management Area. The program focused on improving the survival of calves and yearlings through wolf predation control. Following these activities, moose abundance increased in the area, but the association between control activities and the increased moose abundance was weak due to concurrent mild winters that confounded the results. When the program's efficacy was evaluated, important issues that were considered included moose accessibility, hunter effort, and costs associated with hunting. Ultimately, harvest by local hunters did not increase, and wolf abundance within the IM area returned to precontrol levels by the end of RY19.

Historically, the primary human use of wolves in Unit 24 has been for pelts. Local resident demand for wolf pelts, for use in garment sewing and sharing at ceremonial potlatches, has traditionally been high (Nelson et al. 1982). Additionally, local residents perceive wolves as direct competitors for moose and often make a conscious effort to increase their wolf harvest when moose seem scarce.

Management Direction

The management direction for Unit 24 ensures that wolves will persist as part of the natural ecosystem and ensures continued wolf hunting, trapping, and viewing opportunities. There is no indication that statewide goals (ADF&G 2002) for human uses cannot be met, and there are no concerns for the long-term sustainability of this population.

Existing Wildlife Management Plans

The *Koyukuk River Moose Management Plan 2000–2005: Unit 24 and the northern portion of Unit 21D* was published in March 2001 and is still active (Koyukuk River Moose Hunters Working Group 2001). This plan identified predation on moose as significant and increasing, stipulated an objective to provide for increased harvest of moose predators (including wolves), and provided a recommendation to implement aerial wolf control. The plan is expected to make progress toward IM objectives for increased moose abundance and harvest.

A subsequent plan was then published in 2012, the *Operational Plan for Intensive Management of Moose in Game Management Unit 24(B) during Regulatory Years 2012–2017* (ADF&G 2012). This operational plan defined an experimental program for wolf control in an area including the communities of Allakaket and Alatna to benefit moose survival for increasing sustainable harvest of moose. This operational plan complemented the IM plan in regulation (5 AAC 92.124) and became inactive in RY18.

GOALS

G1. Ensure long-term conservation of wolves throughout their historic range in Alaska in relation to their prey and habitat.

G2. Provide for the broadest possible range of human uses and values of wolves and their prey populations that meet wildlife conservation principles and which reflect the public's interest.

G3. Increase public awareness and understanding of uses, conservation, and management of wolves, their prey, and habitat in Alaska.

CODIFIED OBJECTIVES

C1. Maintain a minimum of 100 wolves in Unit 24B during the IM program (5 AAC 92.124).

These legal objectives are codified into law and remain in effect. However, the IM program became inactive in RY18.

Amounts Reasonably Necessary for Subsistence Uses

C2. Unit 24 has a positive customary and traditional use finding for wolves, as determined by BOG, with an amount necessary for subsistence uses (ANS) of 90% of the harvestable portion. For purposes of determining ANS, a harvest rate that achieves population regulation is estimated to occur at 30% of the annual population and a harvest rate that benefits prey is estimated to occur at 50%, for at least 5 years. Therefore, ANS would vary depending on the population fluctuation of wolves and would be 27% to 45% of the annual population estimate.

MANAGEMENT OBJECTIVES

M1. Maintain a fall density of 13–23 wolves/1,000 mi^2 (5–9 wolves/1,000 km^2).

This population density range is consistent with the long-term sustainability for wolf densities published in literature (Adams et al. 2008, Gardner and Pamperin 2014). The wolf population likely fluctuates within this range concurrent with regulated compensatory harvest. Although most local residents and hunters visiting the area advocate for densities on the low end of this range, National Wildlife Refuge (NWR) and U.S. National Park Service (NPS) land management policies play an important role in managing Unit 24 wolves and dictate that higher wolf densities will persist as long as current levels of prey species remain relatively abundant.

M2. Provide for a total annual public harvest of 112–162 wolves.

MANAGEMENT ACTIVITIES

1. Population Status and Trend

ACTIVITY 1.1 Conduct annual minimum wolf count (MWC; Gardner and Pamperin 2014) surveys to determine the minimum number of wolves in Unit 24B for IM regulatory requirements, if funding and weather allow (objectives M1 and C1).

Data Needs

Abundance data are needed for this activity to determine that at least 100 wolves occupy Unit 24B, as required by the predator control plan in 5AAC 92.124(c)(3)(C). An MWC survey will be adequate to establish the persistence of the minimum number of wolves. Although 100 wolves are a regulatory requirement, it also represents the minimum number of wolves needed for a biologically sustainable population.

An MWC number will also demonstrate that the wolf population in Unit 24 has met the population objective as described in M1. The population density objective of 13–23 wolves/1,000 mi^2 (5–9 wolves/1,000 km^2) is interpreted to be the minimum density of wolves needed for a long-term sustainable population. MWCs do not have a range of values, confidence intervals, or statistical inference, and therefore will only be used to evaluate the minimum wolf abundance relative to the M1 population objectives.

Methods

MWC surveys are conducted in Unit 24B as described by Gardner and Pamperin (2014). One MWC survey was completed in RY16, RY17, and RY19 to assess sustainability of the wolf population as required by the Unit 24B predation control plan (5AAC 92.124). As prescribed in the IM plan, a minimum population of 100 wolves in Unit 24B is an approximate 50% reduction from the precontrol population. This is a level that will ensure that wolves persist as part of the natural ecosystem in Unit 24B and ensures there will be continued wolf hunting, trapping, and viewing opportunities.

Results and Discussion

A total of 59 wolves (12.4 wolves/1,000 mi^2) in 12 packs were identified in the RY16 survey area in 55.8 hours of flight time. Of the 59 total wolves identified, 1 was a single. The potential IM area had a total of 9–16 wolves in 3–4 packs. The remaining 43–50 wolves (8–9 packs) were outside the IM area, distributed throughout the Kanuti Refuge. ADF&G biologists directly observed 8 of the packs. The number of wolves in the remaining 3 packs and 1 single were identified by tracks. Pack sizes ranged from 1 to 16 wolves (Table 1).

A total of 72 wolves (15.2 wolves/1,000 mi^2) in 16 packs were identified in the RY17 survey area in 60.2 hours of flight time. Of the 72 total wolves identified, 1 was single. The potential IM area had a total of 17–18 wolves in 6 packs. The remaining 54–55 wolves (10 packs) were outside the IM area, distributed throughout the Kanuti Refuge. We directly observed 12 of the packs. The number of wolves in the remaining 3 packs and 1 single were identified by tracks. Pack sizes ranged from 1 to 11 wolves.

Table 1. Unit 24 late winter aerial minimum wolf count survey results across 4,752 mi^2, Interior Alaska, regulatory years 2016–2019.

Survey dates	Minimum count	Number of packs	Search intensity (min/mi^2)	Density (wolves/1,000 mi^2)
4–9 April 2017	59	12	0.70	12.4
22–26 March 2018	72	16	0.76	15.2
25–29 February 2020	93–96	20–21	0.75	19.6

Source: Minimum wolf count survey from Gardner and Pamperin (2014).

A total of at least 93 wolves (19.6 wolves/1,000 mi^2) in at least 20 packs were identified in the RY19 survey area in 59.6 hours of flight time. Of the 93 total wolves identified, 2 were singles. The potential IM area had a total of 41–43 wolves in 9 packs. The remaining 50–52 wolves (12 packs) were outside the IM area distributed throughout the Kanuti Refuge. We directly observed 12 of the packs and 2 of the singles. The number of wolves in the remaining 6 packs were identified by tracks. Pack sizes ranged from 1 to 9 wolves.

Recommendations for Activity 1.1

Continue to conduct MWC surveys each year when funding is available or as required by the predator control plan.

ACTIVITY 1.2. Using survey results and other methods, estimate Unit 24 wolf population abundance (objectives M1 and C1).

Data Needs

An estimate of wolf abundance is needed to establish that a minimum number of wolves persist in Unit 24 to ensure that wolves remain an integral part of Interior Alaska's ecosystems.

Methods

Historical estimates of wolf and prey densities and updated estimates of survey data or published results will be used to estimate wolf abundance. Density estimates will be multiplied by the size of the unit or area of consideration. Abundance estimates for Units 24A, 24B, 24C, and 24D will be summed to estimate the Unit 24 wolf population abundance.

An abundance estimate of the Unit 24 wolf population will be composed of minimum counts from aerial wolf surveys (Activity 1.1) and extrapolations for habitat beyond the area surveyed, using wolf density information from similar habitats reported in the literature or other sources. In some instances, a professional judgment of wolf density may need to be developed by the area biologist using general knowledge of the Game Management Unit.

Results and Discussion

A radiotelemetry study of wolves conducted in a 9,537 mi^2 portion of Gates of the Arctic National Park indicated that wolf density averaged 17.1 wolves/1,000 mi^2 (6.6 wolves/1,000 km^2) in the fall and 11.7 wolves/1,000 mi^2 (4.5 wolves/1,000 km^2) in the spring (Adams et al. 2008). Using those densities for the portion of that study in Units 24A and 24B (5,775 mi^2), ADF&G biologists estimated 68–99 wolves (Table 2). By plotting known pack

locations from that study and by assuming a density of 15–21 wolves/1,000 mi^2 (6–8 wolves/1,000 km^2) for the remainder of the area that was not part of that study (4,643 mi^2), we estimated 70–98 wolves. The composite estimate was 138–197 wolves in northern Unit 24 (Brooks Range portion of Units 24A and 24B; 10,418 mi^2).

Table 2. Composite estimate of wolf abundance for northern Units 24A and 24B, central Unit 24, and Unit 24D, Interior Alaska, regulatory years 2015–2019.

Unit	Estimated area	Area size (mi^2)	Density (wolves/1,000 mi^2)	Estimated number	Type of estimate
Northern Units 24A and 24B	GAAR[a,f]	5,775	11.7–17.1	68–99	TMR[b]
	Remainder[f,g,i]	4,643	15–21	70–98	Extrapolated
	Subtotal	10,418	13.2–18.9[c]	138–197	Composite
Central Unit 24	Kanuti and IM[d] area[h]	4,752	15–21	72–96	MWC[j]
	Remainder[h,j]	5,548	10–15	55–84	Extrapolated
	Subtotal	10,300	12–21f[e]	127–180	Composite
Southern Unit 24	2000 SUPE[e] survey[k]	4,175	27.7–43.1	15.6–180.0	SUPE[e] (Statistical)
	Remainder[f,g,i]	1,175	15–21	18–25	Extrapolated
	Subtotal	5,350	25–38[e]	134–205	Composite
All of Unit 24	Unit 24 total	26,068	15.3–22.3[c]	399–582	Composite

[a] GAAR is Gates of the Arctic National Park.
[b] TMR refers to territory mapping using radiotelemetry (Gardner and Pamperin 2014).
[c] Estimated number of wolves divided by area size.
[d] IM refers to intensive management.
[e] SUPE refers to sample unit probability estimator (Becker et al. 1998, 2004).
[f] Adams et al. 2008.
[g] Unit 24B intensive aerial wolf survey (Gardner and Pamperin 2014).
[h] Alaska Department of Fish & Game.
[i] Unit 24B minimum wolf count survey (Gardner and Pamperin 2014).
[j] Alaska Department of Fish & Game and U.S. Fish and Wildlife Service memos.
[k] Alaska Department of Fish & Game memo.

Using the RY16, RY17, and RY19 minimum counts from the 3 surveys on the Kanuti NWR and extrapolating densities of similar habitats to the areas that were not surveyed, we estimate 127–180 wolves occur in Units 24B and 24C (remainder area; 12–21 wolves/1,000 mi^2; 5–8 wolves/1,000 km^2).

In Unit 24D, the 2000 sample unit probability estimator (SUPE) statistical estimate indicated 147.8 wolves (± 32.2 wolves; 90% confidence interval [CI]; 36 wolves/1,000 mi^2; 14 wolves/1,000 km^2; 4,175 mi^2), and we assume little change since that survey. We extrapolated a density of 15–21 wolves to the remaining 1,175 mi^2 of Unit 24D from Unit 24 data with similar habitat. Therefore, the Unit 24 composite estimate was developed using previously reported values (Stout 2018); the minimum counts from the RY16, RY17, and RY19 surveys; literature values (Adams et al. 2008); and the 2000 SUPE statistical estimate.

Based on values reported during RY10–RY14 (Stout 2018) and updated based on where surveys were conducted during RY15–RY19, the estimated population densities were highest (25–38 wolves/1,000 mi^2; 9–15 wolves/1,000 km^2) and appeared to be the most stable in southern Unit 24 (Unit 24D). Wolf densities were moderate in northern Unit 24 (Brooks Range portion of Units 24A and 24B; 13–19 wolves/1,000 mi^2; 5–7 wolves/1,000 km^2) and central Units 24B and 24C (remaining area; 12–21 wolves/1,000 mi^2; 5–8 wolves/1,000 km^2). Based on these

estimates, population objectives of 13–23 wolves/1,000 mi^2 (M1) and 100 wolves (C1) were met during the report period.

The fall season population composite estimate for all of Unit 24 was 399–582 wolves (15.3–22.3/1,000 mi^2; 5.9–8.6 wolves/1,000 km^2) in 56–68 packs during the report period and represents only a small change from the previous report period (Stout 2018).

Recommendations for Activity 1.2

Continue this activity to estimate the wolf population for Unit 24.

2. Mortality-Harvest Monitoring and Regulations

ACTIVITY 2.1. Monitor harvest through sealing records (objective M2).

Data Needs

Fur sealing data from ADF&G's Wildlife Information Network (WinfoNet) are needed annually to assess trends in harvest. Pack size, location of harvest, and hunter and trapper effort are critical elements needed to assess harvest trends and corroborate aerial survey observations. Harvest estimates are needed to establish that the population is not being harvested in excess of sustained yield.

Methods

Wolves harvested by trappers and hunters are sealed to monitor harvest. Harvest data are archived in WinfoNet and reported by regulatory year. Information recorded for each wolf includes date of kill, name of trapper or hunter, specific location of kill, method of take and transportation, sex of the wolf, color of the pelt, and the number of other wolves thought to be in the pack.

Because wolf fur sealing data are sometimes inconsistently reported in Unit 24, tests of statistical inference are not recommended. Regression analysis of harvest trend or measures of variation on mean harvest values are likely invalid. Alternatively, evaluation of wolf fur sealing data should be limited to general assessment of dramatic changes and probable causes for those variations. Generalized assessments (higher, stable, or lower) are a matter of professional judgment and are based on anecdotal information obtained during other surveys or trapper interviews. Harvest trends are evaluated using the weight of evidence of all harvest or survey data that are available. Harvest assessment is compared relative to the harvest objective. The harvest objective is considered met if the summed estimated harvest and reported harvest meets or exceeds the lower range of the harvest management objective of 112 wolves. Alternatively, if population estimates meet or exceed the objective but harvest is below the objective, ADF&G biologists will consider management strategies to provide greater opportunity for harvest of wolves.

Season and Bag Limit

Unit 24 wolf season and bag limit, regulatory years 2015–2019.

Activity	Bag limit	Resident open seasons	Nonresident open seasons
Hunting	10 wolves	10 August–30 April	10 August–30 April
Trapping	No limit	1 November–30 April	1 November–30 April

Results and Discussion

Harvest by Hunters-Trappers

Hunters and trappers reported harvesting 3–32 wolves annually during RY15–RY19 (Table 3). The actual number of wolves harvested can be inferred to be higher because most local community residents seal only those wolf pelts sent to a commercial tannery or sold to a fur buyer. Hunting and trapping conditions vary from year to year, which affects harvests. The estimated unreported harvest of wolves per year is variable depending on trapping conditions, but an average of 30 wolves per year is reasonable (Woolington 1997). During the report period, travel conditions were generally very good, with average snow depth facilitating movement. The increase in wolves harvested under same-day-airborne was a result of the department predator control program.

Table 3. Unit 24 wolf harvest, Interior Alaska, regulatory years 2015–2019.

Regulatory year	Reported harvest				Total estimated harvest	Method of take			
	Male	Female	Unknown	Total		Trap/ snare	Shot	SDA[a]	Unknown
2015	16	7	1	24	54	9	4	10[b]	1
2016	2	1	0	3	33	2	1	0	0
2017	11	7	1	19	49	10	9	0	0
2018	4	5	6	15	45	7	8	0	0
2019	17	15	0	32	62	21	11	0	0

Note: Unreported harvest estimated at 30 wolves for all regulatory years.

[a] SDA stands for same-day-airborne, a term for animals taken by hunters the same day hunters or trappers were airborne.

[b] ADF&G intensive management program.

Harvest Chronology

Wolves are generally taken between December and March, and the highest harvest is typically in February (Table 4). The proportion of harvest occurring in fall has increased due to reduced overall harvest in winter months, when wolves were typically harvested in the past.

Transport Methods

Most wolves were taken by hunters and trappers using snowmachines for transportation during RY15–RY19 (Table 5). However, a shift in the percentage of wolves taken by highway vehicles caused an overall harvest decline among those who did not use the road system, even though the

total number of wolves taken by highway vehicles along the Dalton Highway did not increase markedly. The increase in wolves harvested using aircraft in RY15 was a result of the department predator control program.

Table 4. Unit 24 wolf percent harvest chronology by month, Interior Alaska, regulatory years 2015–2019.

	Percent harvest chronology by month							
Regulatory year	August–October	November	December	January	February	March	April	*n*[a]
2015	13	0	9	13	17	48	0	23
2016	33	0	0	0	0	67	0	3
2017	32	5	11	21	5	21	5	19
2018	0	0	50	0	7	36	7	14
2019	25	19	3	22	19	13	0	32

[a] Includes harvest with known regulatory year but unknown month.

Table 5. Unit 24 wolf percent harvest by transport method, Interior Alaska, regulatory years 2015–2019

	Percent harvest by transport method								
Regulatory year	Airplane	Dogsled/skis/ Snowshoes	Boat	3- or 4-wheeler	Snowmachine	ORV[a]	Highway vehicle	Unknown	*n*[b]
2015	43	4	0	0	13	0	35	4	23
2016	33	67	0	0	0	0	0	0	3
2017	11	0	16	0	42	0	26	5	19
2018	0	0	0	0	40	0	60	0	15
2019	6	6	10	0	45	0	26	6	31

[a] ORV stands for off-road vehicles.
[b] Indicates harvest with unknown transport method.

Alaska Board of Game Actions and Emergency Orders

No changes were adopted, and no emergency orders were issued during RY15–RY19. In RY10, ADF&G biologists presented to BOG an IM feasibility assessment, evaluating a wolf control program that could potentially increase moose calf and yearling survival in a 1,360 mi^2 portion of Unit 24B around the communities of Alatna and Allakaket. The Alaska State Legislature approved funding for that IM program in RY11. BOG adopted the IM plan at their March 2012 meeting, and the program, which included aerial wolf control conducted by department personnel, began in RY12. The IM plan became inactive in RY18.

Recommendations for Activity 2.1

Continue this activity.

ACTIVITY 2.2. Monitor wolf numbers and population characteristics through interviews with trappers, hunters, pilots, and by evaluation of sealing documents (objectives M1 and M2).

Data Needs

Wolf harvest information that may not be reported using the wolf sealing program is needed to assess unreported harvest. General observations by hunters and trappers are useful to identify unique occurrences that may forecast important changes in the wolf population. Harvest estimates are needed to establish that the population is not being harvested in excess of sustained yield.

Methods

ADF&G biologists conducted annual informal interviews with trappers during phone calls and face-to-face conversations regarding trapping effort, numbers of wolves taken, numbers of wolves other trappers have harvested, location of trapping effort, pack sizes observed, condition of wolves, and other observations they noted. Wolf harvest data was collected and recorded opportunistically for each RY. Wolf harvest will be recorded and archived in Galena area office files. Harvest of wolves by trappers was compared to wolf sealing records to estimate the potential number of wolves that are likely unreported. The unreported harvest will be estimated in RY19 and adjusted accordingly in Table 3 of the management report for the next reporting period. To the degree that the statewide trapper questionnaires provide information, those data may be incorporated into this assessment.

Results and Discussion

As a result of conducting trapper interviews, it is apparent that some wolves are harvested but not sealed. Some of the unreported wolves are donated to family members or friends during traditional potlatch ceremonies. Although the number of interviews conducted annually was inconsistent, an estimated 30 wolves are harvested and unreported annually in Unit 24 based on several years of assessment of wolves of the Unit 24 communities (Table 3).

Recommendations for Activity 2.2

Continue to increase the number of trapper interviews conducted annually. Build relationships with new trappers to expand the base of information used to estimate unreported harvest.

ACTIVITY 2.3. Model (PredPrey) the potential effects of wolf predation on ungulates in each unit (McNay and DeLong 1998) to evaluate potential for ungulate harvest (objective 1).

Data Needs

Input data needed to generate models will include population estimates and vital demographic statistics for prey and predator species in Unit 24. Examples of vital demographic statistics include survival rates, predation rates, consumption rates of predators, or harvest rates of prey species by humans. If specific data are not available for Unit 24, literature values for similar populations will be needed. The process required to build models can highlight matters that are more important than the projected population trends. While generating these models, ADF&G

biologists will need to document gaps in available data to understand those factors that have the greatest potential effects on population trends.

Wolf survey results and population estimates generated from Activities 1.1, 1.2, and 1.3, and moose density estimates from moose management reports are needed to develop population models unitwide. In Units 24A and 24B, Dall sheep and caribou estimates from their respective management reports are needed for model inputs of alternate prey species. In Units 24C and 24D, when the Western Arctic caribou are present, estimates of their abundance are also needed for alternate prey species modeling. It is important to clarify that identifying issues of potential concern in the population is the most important result generated from PredPrey, as opposed to the population forecasting outputs.

Methods

ADF&G biologists will enter data into the PredPrey model to evaluate predator and prey abundance estimates. We will also evaluate prey productivity data from survey data and reported literature, prey harvest estimates from species management reports, and literature values of predation rates. PredPrey models will be used to evaluate data gaps or identify potentially important factors that are influencing the population dynamics of wolves and their prey in Unit 24.

Results and Discussion

The PredPrey model software is no longer supported, so this activity was postponed until the department leadership determines whether to update the necessary software. Pursuing this activity in the future will be dependent on department priorities to update that software.

Recommendations for Activity 2.3

If programming is updated, continue to improve modeling of wolf populations and their effect on prey populations. Update model parameters when new information is available.

ACTIVITY 2.4. Conduct trapper education clinics (objective 2).

Data Needs

Clinics are not a data gathering effort; they are a public education effort. If ADF&G biologists conduct clinics, we will follow up to evaluate trapping effort and success among participants in harvesting wolves.

Methods

Clinics will be resumed upon completion of the Unit 24B IM program. Those trapper education clinics will focus on wolf snaring methods. Snaring clinics should provide information on building wolf snares, effective sets, snare locations that prevent incidental catch of moose, snare construction to divert moose or facilitate moose release, wolf and moose biology, vendor suppliers for snare materials, and wolf hide handling.

Results and Discussion

No wolf snaring clinics were conducted during RY15–RY19.

Recommendations for Activity 2.4

Resume clinics when the IM program in Unit 24B is concluded.

3. Habitat Assessment-Enhancement

No habitat assessment or enhancement activities occurred in Unit 24 during RY15–RY19.

NONREGULATORY MANAGEMENT PROBLEMS OR NEEDS

Data Recording and Archiving

Data collected during aerial surveys will be recorded on the Wolf Census Form (Appendix).

Global Positioning System (GPS) location data will be logged using World Geodetic System 84 data. GPS files will be stored on the Galena area biologist hard drive D:/WOLF/Surveys/[year]. Files will be saved using MapSource (Garmin Ltd., 2008, Ver. 6.13.7). Alternatively, location data for analysis and mapping will use ArcGIS (ESRI 2013. ArcGIS Desktop: Release 10.2.2. Redlands, California: Environmental Systems Research Institute.), and will be stored on the Fairbanks Regional DWC hard drive, S:/Stout/Wolf/[year]. The "D" drive of the Galena area biologist's hard drive will be backed up twice annually onto an external computer hard drive.

Hardcopies of species wildlife management reports and plans and the IM operational plan for wolves in Unit 24 will be stored in the Fairbanks Regional Office Library and online[2]. Memos, data forms, and additional hard copies will be stored in the Galena area biologist files in Fairbanks and Galena offices.

Electronic copies of data, reports, survey memos, survey data (including metadata), and maps will be stored in WinfoNet. Project Title: Wolf Management Program. Project ID: GMU 24. Primary Region: Region III.

Agreements

Currently, there are no agreements with other agencies pertaining to wolf management.

Permitting

The Animal Care and Use Committee Authorization – 2015 Renewal is found on the Galena Office hard drive in the Veterinary Records file.

Conclusions and Management Recommendations

The Unit 24 wolf population was stable during RY15–RY19 and has changed little since RY93, with some localized annual fluctuations. Based on values reported in RY10–RY14 (Stout 2018) and updated where surveys were conducted during this report period, the estimated population densities were highest (25–38 wolves/1,000 mi^2; 9–15 wolves/1,000 km^2) and stable in southern

[2] http://www.adfg.alaska.gov/index.cfm?adfg=librarypublications.wildlifemanagement

Unit 24 (Unit 24D). Wolf densities were moderate in northern Unit 24 (Brooks Range portion of Units 24A and 24B; 13–19 wolves/1,000 mi^2; 5–7 wolves/1,000 km^2) and in central Unit 24B and 24C (remainder area; 12–21 wolves/1,000 mi^2; 5–8 wolves/1,000 km^2). Based on these estimates, population objectives (M1) of 13–23 wolves/1,000 mi^2 and (C1) 100 wolves were met during the report period.

Based on the Unit 24 composite estimate of 399–582 wolves (15.3–22.3/1,000 mi^2; 5.9–8.6 wolves/1,000 km^2), the population size for objective M1 of 13–23 wolves/1,000 mi^2 (5–9 wolves/1,000 km^2) was met. Although estimated annual harvest averaged only 48.6 wolves over the report period, objective M2 (112–162 wolves) was met because the population could support a harvest of at least 120–175 wolves. Wolf hunting and trapping regulations were liberal and did not restrict opportunity. Adams et al. (2008) reported that harvest was moderate in northern Unit 24 and was not limiting the population. Harvest declined throughout Unit 24 during the report period as a result of decreased demand but not due to population reductions. Harvest monitoring was an important part of the wolf management program and included the statewide sealing system and trapper interviews.

ADF&G biologists do not expect to be able to detect changes in the Unit 24 wolf population through any single monitoring activity prescribed in this report. The infrequency of aerial surveys, variability in survey conditions, sampling error, budget limitations, size of the area, and unreliability of harvest data are realities that cannot be overcome under the existing management paradigm. It is more reasonable to expect that a combination of the metrics we assess collectively, including trapper interviews or other field observations, will alert managers should sustainability of the Unit 24 wolf population become a concern. For the same reasons, failure to meet any single objective or the degree to which an objective was not achieved will not independently trigger management action.

II. Project Review and RY20–RY24 Plan

Review of Management Direction

Management Direction

The management direction for Unit 24 ensures that wolves will persist as part of the natural ecosystem and ensures continued wolf hunting, trapping, and viewing opportunities. There is no indication that statewide goals (ADF&G 2002) for human uses cannot be met, and there are no concerns for the long-term sustainability of this population.

Goals

G1. Ensure long-term conservation of wolves throughout their historic range in Alaska in relation to their prey and habitat.

G2. Provide for the broadest possible range of human uses and values of wolves and their prey populations that meet wildlife conservation principles and that reflect the public's interest.

G3. Increase public awareness and understanding of uses, conservation, and management of wolves, their prey, and habitat in Alaska.

CODIFIED OBJECTIVES

C1. Maintain a minimum of 100 wolves in Unit 24B during the IM program (5 AAC 92.124).

Amounts Reasonably Necessary for Subsistence Uses

C2. Unit 24 has a positive customary and traditional use finding for wolves, as determined by BOG, with an ANS of 90% of the harvestable portion. For purposes of determining ANS, a harvest rate that achieves population regulation is estimated to occur at 30% of the annual population and a harvest rate that benefits prey is estimated to occur at 50% for at least 5 years. Therefore, ANS would vary depending on the population fluctuation of wolves and would be 27% to 45% of the annual population estimate.

These legal objectives are codified into law and remain in effect.

MANAGEMENT OBJECTIVES

M1. Maintain a fall density of 13–23 wolves/1,000 mi^2 (5–9 wolves/1,000 km^2).

This population density range is consistent with the long-term sustainability for wolf densities published in literature (Adams et al. 2008, Gardner and Pamperin 2014). The wolf population likely fluctuates within this range with regulated compensatory harvest of wolves occurring. Although most local residents and hunters visiting the area advocate for densities on the low end of this range, NWR and NPS land management policies play an important role in Unit 24 and dictate that higher wolf densities will persist as long as current levels of prey species remain relatively abundant.

M2. Provide for a total annual public harvest of 112–162 wolves.

This range of wolf harvest is consistent with literature values for sustainable wolf harvest rates of approximately 30% annually (Gasaway et al. 1983, Ballard et al. 1987, Hayes et al. 2003).

No additional management objectives for the Unit 24 wolf population are necessary at this time.

REVIEW OF MANAGEMENT ACTIVITIES

1. Population Status and Trend

ACTIVITY 1.1 ADF&G biologists will conduct MWC (Gardner and Pamperin 2014) surveys to determine the minimum number of wolves in Unit 24B for IM regulatory requirements (objectives M1 and C1).

Data Needs

Abundance data are needed for this activity to determine that at least 100 wolves occupy Unit 24B as required by the predator control plan in 5AAC 92.124(c)(3)(C). An MWC survey will be adequate to establish the persistence of the minimum number of wolves. Although the minimum abundance of 100 wolves is a regulatory requirement, it also represents the minimum number of wolves needed for a biologically sustainable population.

An MWC will also provide a minimum count that demonstrates the wolf population in Unit 24 has met the population objective. The population density objective of 13–23 wolves/1,000 mi^2 (5–9 wolves/1,000 km^2) is interpreted to be the minimum density of wolves needed for a long-term sustainable population. MWCs do not have a range of values, confidence intervals, or statistical inference and will only be used to evaluate the minimum wolf abundance relative to the population objectives.

Methods

MWC surveys are described by Gardner and Pamperin (2014), and all MWC surveys conducted in Unit 24B will be designed to meet those previously described methods. An MWC survey will be planned as the first option in RY20–RY24.

ACTIVITY 1.2. ADF&G biologists will use survey results and other methods to estimate Unit 24 wolf population abundance (objectives M1 and C1).

Data Needs

An estimate of the Unit 24 wolf population will be needed to combine minimum count data from aerial wolf surveys conducted as part of Activity 1.1 and extrapolations for habitat beyond the area surveyed, using wolf density information from similar habitats reported in literature or other sources. In some instances, a professional judgment of wolf density may need to be developed by the area biologist using general knowledge of the Game Management Unit.

Methods

Historical estimates of wolf and prey densities and updated estimates of survey data or published results will be used to estimate wolf abundance. Density estimates will be multiplied by the size of the unit or area of consideration. Abundance estimates for Units 24A, 24B, 24C, and 24D will be summed to estimate the Unit 24 wolf population abundance. An estimate of the wolf population that would require statistical inference and trend analysis will not be completed. Unit 24 estimates will be compared to the minimum population objective of 13 wolves/1,000 mi^2.

2. Mortality-Harvest Monitoring

ACTIVITY 2.1. ADF&G biologists will monitor harvest through sealing records (objective M2).

Data Needs

Fur sealing data from WinfoNet are needed annually to assess trends in harvest. Pack size, location of harvest, and hunter and trapper effort are critical elements needed to assess harvest trends and corroborate aerial survey observations.

Methods

Wolves harvested by trappers and hunters will continue to be sealed to monitor harvest. Fur sealing data used will be archived in databases accessible through WinfoNet and queried annually to access reported wolf harvest data for Unit 24.

Because wolf fur sealing data are sometimes inconsistently reported in Unit 24, tests of statistical inference are not recommended. Regression analysis of harvest trend or measures of variation on mean harvest values are likely invalid. Alternatively, evaluation of wolf fur sealing data should be limited to general assessment of dramatic changes and probable causes for those variations. Generalized assessments (higher, stable, or lower) will be a matter of professional judgment and often be based on anecdotal information obtained during other surveys or trapper interviews. Harvest trends will be evaluated using the weight of evidence of all harvest or survey data that are available. Harvest assessments will be compared relative to the harvest objective. The harvest objective will be considered met if the summed estimated harvest and reported harvest meet or exceed the lower range of the harvest management objective of 112 wolves. Alternatively, if population estimates meet or exceed objective but harvest is below objective, ADF&G biologists will consider management strategies to provide greater harvest opportunity for wolves.

ACTIVITY 2.2. ADF&G biologists will monitor wolf numbers and population characteristics through interviews with trappers, hunters, pilots, and by evaluation of sealing documents (objectives M1 and M2).

Data Needs

Wolf harvest information that may not be reported using the wolf sealing program is needed to assess unreported harvest. General observations by hunters and trappers are useful to identify unique occurrences that may forecast important changes in the wolf population. Harvest estimates are needed to establish that the population is not being harvested in excess of sustained yield.

Methods

ADF&G biologists will annually conduct informal interviews with trappers during phone calls and face-to-face conversations regarding trapping effort, numbers of wolves taken, numbers of wolves other trappers have taken, location of trapping effort, pack sizes observed, condition of wolves, and other observations they noted. Wolf harvest data will be collected and recorded opportunistically for each RY. Wolf harvest will be recorded and archived in Galena area office

files. Harvest of wolves by trappers will be compared to wolf sealing records to estimate the number of wolves that are likely unreported. The unreported harvest will be estimated in RY19 and adjusted accordingly in Table 3 of the management report for the next reporting period. To the degree that the statewide trapper questionnaires provide information, those data may be incorporated into this assessment.

ACTIVITY 2.3. ADF&G biologists will model (PredPrey) the potential effects of wolf predation on ungulates in each unit (McNay and DeLong 1998) to evaluate potential for ungulate harvest (objective C1).

Data Needs

Input data needed to generate models will include population estimates and vital demographic statistics for prey and predator species in Unit 24. Examples of vital demographic statistics include survival rates, predation rates, consumption rates of predators, or harvest rates by humans of prey species. If specific data are not available for Unit 24, literature values for similar populations will be needed. The process required to build models can highlight matters that are more important than the projected population trends. While generating these models, ADF&G biologists will need to document gaps in available data to understand those factors that have the greatest potential effects on population trends.

Methods

Develop a population estimate in RY19 if revised data are available. Wolf survey results and population estimates generated from Activities 1.1, 1.2, 2.1, and 2.2, and moose density estimates from moose management reports are needed to develop population models. In Units 24A and 24B, Dall sheep and caribou estimates from their respective management reports are needed as alternate prey species. In Units 24C and 24D, when the Western Arctic caribou are present, estimates of their abundance are also needed for alternate prey species modeling. Identifying issues of potential concern in the population are the most important products generated from predictive models, as opposed to the population forecasting outputs. The ability to conduct this activity is dependent on the PredPrey software being updated.

ACTIVITY 2.4. ADF&G biologists will conduct trapper education clinics (objective 2).

Data Needs

Clinics are not a data gathering effort; they are a public education effort. If ADF&G biologists conduct a clinic, we will follow up to evaluate trapping effort and success among participants in harvesting wolves.

Methods

Clinics will be resumed upon completion of the Unit 24B IM program. These will be trapper education clinics with a focus on wolf snaring methods. Snaring clinics should provide information on building wolf snares, effective sets, snare locations that prevent incidental catch of moose, snare construction to divert moose or facilitate moose release, wolf and moose biology, vendor suppliers for snare materials, and wolf hide handling.

3. Habitat Assessment-Enhancement

No activities for wolf habitat assessment or enhancement are expected in Unit 24 for RY20–RY24.

NONREGULATORY MANAGEMENT PROBLEMS OR NEEDS

Data Recording and Archiving

Data collected during aerial surveys will be recorded on the Wolf Census Form (Appendix).

GPS location data will be logged using WGS 84 data. GPS files will be stored on the Galena area biologist hard drive D:/WOLF/Surveys/[year]. Files will be saved using MapSource (Garmin Ltd., 2008, Ver. 6.13.7). Alternatively, location data for analysis and mapping will use ArcGIS (ESRI 2013. ArcGIS Desktop: Release 10.2.2. Redlands, California: Environmental Systems Research Institute.), and will be stored on the Fairbanks Regional DWC hard drive, S:/Stout/Wolf/[year]. The "D" drive of the Galena area biologist's hard drive will be backed up twice annually onto an external computer hard drive.

Hard copies of species wildlife management reports and plans and the IM operational plan for Wolf – Unit 24 will be stored in the Fairbanks Regional Office Library and online[3]. Memos, data forms, and additional hard copies will be stored in the Galena area biologist files in Fairbanks and Galena offices.

Electronic copies of data and reports will be stored in the WinfoNet – Data Archive. Project Title: Wolf Management Program. Project ID: GMU 24. Primary Region: Region III.

Electronic copies of survey memos, survey data (including metadata), and maps are also stored in the WinfoNet – Data Archive. Project Title: Unit 24 Wolf. Primary Region: Region III.

Agreements

Currently, there are no agreements with other agencies pertaining to wolf management.

Permitting

No permits are expected during this period.

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[3] http://www.adfg.alaska.gov/index.cfm?adfg=librarypublications.wildlifemanagement

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Appendix. Unit 24 wolf census form, regulatory years 2015–2019.

WOLF CENSUS FORM

Date _____ *GMU* _____ *Aircraft Hours* _____

Pilot _____ Observer _____

Snow Age	Snow Cover	Light Type	Light Intensity	Predominant Habitat in SU	Survey Rating
1. 1-2 days 2. 3-4 days 3. 5-6 days 4. 7+ days	1. Complete 2. Some low veg showing 3. Bare ground showing	1. Bright 2. Flat	1. High 2. Medium 3. Low	1. OPEN lower elev.shrubs/wetland 2. DECIDUOUS FOREST birch, aspen 3. MIXED FOREST 4. OPEN CONIFEROUS FOREST 5. DENSE CONIFEROUS FOREST 6. SUB-ALPINE SHRUB 7. BURN	A. Excellent B. Good C. Fair D. Poor

PACK INFORMATION

Ref. No.	SU track 1st spotted	Time 1st spotted	SUs containing tracks	SU w/ wolves	Time tracking ended	Pack size	Wolf colors	In/ Out	Comments/Pack Waypoint
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									


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