Wolf Management Report and Plan, Game Management Unit 24:

Report Period 1 July 2010–30 June 2015, and

Plan Period 1 July 2015–30 June 2020

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 area, 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 website.

This species management report and plan was reviewed and approved for publication by Doreen I. Parker McNeill, Region III Management Coordinator for the Division of Wildlife Conservation, Fairbanks.

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Contents

List of Tables

List of Appendices

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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 previous 5 regulatory years (RY; RY10–RY14) and plans for survey and inventory management activities in the 5 years following the end of that period (RY15–RY19). A regulatory year begins 1 July and ends 30 June (e.g., RY10 = 1 July 2010–30 June 2011). This report is produced primarily to provide agency staff with data and analysis to help guide and record its own efforts but is also provided to the public to inform them of wildlife management activities. In 2016 the Alaska Department of Fish and Game's (ADF&G) Division of Wildlife Conservation (DWC) launched this 5-year report to more efficiently report on trends and describe potential changes in data collection activities over the next 5 years. It replaces the wolf management reports of survey and inventory activities that were previously produced every 3 years and supersedes the 1976 draft Alaska wildlife management plans (ADF&G 1976).

I. RY10–RY14 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 ecoregions (ADF&G [n.d.]). Maps for Unit 24 boundaries and special management areas are found at http://www.adfg.alaska.gov/index.cfm?adfg=maps.main.

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*). In the Brooks Range of northern Unit 24A and 24B, wolf abundance was low during the late 1800s because densities of moose, caribou, and Dall sheep (*Ovis dalli*) were low (Campbell 1974). Throughout Unit 24, prey populations increased during the early 1900s, leading to increases in wolf numbers. Moose 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).

Adams et al. (2008) reported wolf population dynamics and harvest patterns in the central Brooks Range of northern Unit 24A and 24B during 1987–1991. They found that autumn wolf

densities averaged 17.1 wolves/1,000 mi^2 (6.6/1,000 km^2) and harvest removed an estimated 12% of the population annually. In that study, the wolf population compensated for human harvest of ≤29% primarily by adjustments in dispersal.

Historically, the primary human use of wolves in Unit 24 has been for pelts. Local resident demand for wolf pelts for 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 the wolf harvest when moose seem scarce.

Management Direction

Wolves in Unit 24 will be managed to provide for human uses and ensure that wolves remain an integral part of Interior Alaska's ecosystems. Compatible human uses include hunting and trapping (both for personal use and commercial sale of furs), photography, viewing, listening, and scientific and educational uses (ADF&G 2002). The aesthetic value of being aware of or observing wolves in natural interactions with their environment is also recognized as an important human use of wolves. Domestication of wolves for personal use or for commercial purposes is generally considered incompatible with department management policies. Management of wolves to reduce predation on moose and enhance consumptive uses was addressed in existing wildlife management plans.

Existing Wildlife Management Plans

- *Koyukuk River moose management plan 2000–2005: Unit 24 and the northern portion of Unit 21D* (still active) (Koyukuk River Moose Hunters Working Group 2001). This plan identified predation on moose as significant and increasing. It stipulated an objective to provide for increased harvest of predators of moose (including wolves) and a recommendation to implement aerial wolf control to make progress toward intensive management objectives for moose abundance and harvest.
- *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 villages of Allakaket and Alatna to benefit moose survival for increasing sustainable harvest of moose. The operational plan complements the intensive management plan in regulation (5 AAC 92.124).

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).

C2. Unit 24 has a positive customary and traditional use finding for wolves, as determined by the Alaska Board of Game (BOG), with an amount necessary for subsistence uses (ANS) of 90% of the harvestable portion. For purposes of achieving this objective, 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 27–45% of the annual population estimate.

Amounts Reasonably Necessary for Subsistence Uses

C1. Unit 24 has a positive customary and traditional use finding for wolves, as determined by BOG, with an amount necessary for subsistence uses of 90% of the harvestable portion.

Intensive Management

Unit 24B: 100–140 wolves.

MANAGEMENT OBJECTIVES

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

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

MANAGEMENT ACTIVITIES

1. Population Status and Trend

ACTIVITY 1.1. Conduct sample unit probability estimator (SUPE; Becker et al. 1998, 2004) or intensive aerial wolf survey (IAWS; Gardner and Pamperin 2014) surveys to estimate wolf abundance (objective M1).

Data Needs

A statistical estimate of the wolf population is needed to evaluate the status of the population and determine whether objective M1 to maintain a fall density of 13–23 wolves/1,000 mi^2 (5–9 wolves/1,000 km^2) was achieved. A statistical estimate of the wolf population derived from sample-based estimator including a measure of the precision is needed to detect change in the population.

Methods

We planned SUPE surveys to estimate late winter wolf population and pack size using aerial surveys. SUPE survey assumptions are described in Becker et al. (1998, 2004), Patterson et al.

(2004), and Gardner and Pamperin (2014): 1) all wolves in the study area move and leave tracks; 2) fresh wolf tracks are not missed; 3) tracks can be followed forward and backward; 4) number of wolves in a pack are correctly enumerated; 5) no packs are doubled counted; 6) there is a 1:1 relationship between packs and tracks counted; and 7) the probability of observing any wolf pack in the study area is >0.

Population estimates made in this reporting period relied in part on surveys conducted in previous reporting periods. In March 1999, we attempted an aerial wolf survey in a limited area of Unit 24D and northern Unit 21D using SUPE methodology (Becker et al. 1998, 2004). However, we were unable to satisfy survey assumptions because of poor snow conditions. During March 2000, we conducted a SUPE survey in approximately the same area as the 1999 survey, primarily in a 4,175 mi^2 survey area (G. Stout, Wildlife Biologist, ADF&G, memorandum, Galena Area Office files, 5 May 2000, Galena). Survey conditions were excellent and assumptions were met. No surveys were attempted in Units 24C or 24D during the reporting period.

During 22–26 March 2012 we attempted to complete an aerial wolf survey following the SUPE guidelines in Unit 24B. However, survey conditions were not adequate to satisfy survey assumptions in a 4,752 km^2 portion of Unit 24B so we completed an IAWS (Gardner and Pamperin 2014). I estimate that gaps in flight paths were not more than approximately 25 mi^2 (G. Stout, ADF&G, memorandum, Galena Area Office files, 22 May 2012, Fairbanks).

Results and Discussion

A total of 67 wolves (14.1 wolves/1,000 mi^2) in 17 packs were counted in the survey area in 51.4 hours of flight time in the 2012 survey. Of the 67 total wolves identified, 1 was single. The total included some wolves just outside the survey area that were tracked from within the survey block. The upper Koyukuk management area (UKMA) had a total of 33 wolves in 9 packs. The remaining 34 wolves (8 packs, 1 single) were outside the UKMA distributed throughout the Kanuti Refuge. We observed all wolves of 11 packs, a portion of 3 packs, a single wolf, and the remaining 3 packs we identified by tracks only. Pack sizes ranged from 2 to 7 wolves. The composition of 3 wolf packs was uncertain. The 2012 wolf survey memorandum can be found on the Galena Office hard drive in the "Surveys" folder.

Recommendations for Activity 1.1

Discontinue this activity. Because objective M1 establishes 13 wolves/1,000 mi^2 (5 wolves/1,000 km^2) as the minimum number of wolves needed to accomplish the goal of ensuring long-term conservation of wolves in Unit 24, a minimum wolf count (MWC; Gardner and Pamperin 2014) survey will adequately accomplish the objective.

ACTIVITY 1.2. Conduct an MWC survey to determine the minimum number of wolves in Unit 24B for IM regulatory requirements (objective M1).

Data Needs

Abundance data are needed for this activity to determine that at least 100 wolves occupy Unit 24B as required by the intensive management plan in the Alaska Administrative Code, 5 AAC 92.124 (c)(3)(C). An MWC survey will be adequate to establish the persistence of the

minimum number of wolves. Although 100 wolves is a regulatory requirement, it also represents the minimum number of wolves needed to for a biologically sustainable population.

Methods

Estimates of wolf abundance in this period relied in part on information gathered in previous reporting periods. During 2005, 2006, and 2008 U.S. Fish and Wildlife Service (USFWS)–Kanuti National Wildlife Refuge (NWR) staff conducted aerial wolf surveys on the Kanuti NWR within Unit 24B using SUPE methodology. The 23–27 March 2005 survey covered a 2,848 mi^2 area (USFWS, Kanuti NWR files, Fairbanks, 20 April 2005). The 14–18 March 2006 survey was in a 2,764 mi^2 area overlapping the 2005 survey (USFWS, Kanuti NWR files, Fairbanks, September 2006), and the 18–22 March 2008 survey was in a 2,844 mi^2 area overlapping the previous surveys (USFWS, Kanuti NWR files, Fairbanks, 25 September 2008). Survey assumptions were not met in any of these years due to snow conditions. Therefore, these results represent MWC for the Kanuti NWR (Table 1).

During 12–14 March 2011 and 22–26 March 2012 we attempted to complete aerial wolf surveys following SUPE guidelines. Using SUPE methodology in 2011, we surveyed a 4,368 mi^2 area of Unit 24B that included the Kanuti NWR and an area northwest of the refuge that was identified as a potential intensive management (IM) area (T. Hollis, Wildlife Biologist, ADF&G, memorandum, Galena Area Office files, 22 March 2011, Fairbanks). We did not satisfy survey assumptions of the SUPE or IAWS during 2011 because of poor snow conditions and the extended period of time between snow accumulation and when the survey was conducted. Therefore, 2011 data were used as a minimum wolf count for the area.

Results and Discussion

A total of 69 wolves (14.5 wolves/1,000 mi^2) in 19 packs were identified in the 2011 survey area in 40 hours of flight time. Of the 69 total wolves identified, 4 were singles. The potential IM area had a total of 50 wolves in 14 packs. The remaining 19 wolves (5 packs) were outside the IM area distributed throughout the Kanuti Refuge. We directly observed 10 of the packs and 1 of the singles. The number of wolves in the remaining 9 packs and 3 singles were identified by tracks. Pack sizes ranged from 1 to 6 wolves.

Recommendations for Activity 1.2

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

Table 1. Unit 24B late winter aerial wolf survey results, Interior Alaska, 2005–2012.

Survey dates	Minimum count	Number of packs	Area surveyed	Search intensity (min/mi^2)	Density (wolves/1,000 mi^2)	Type of survey
23–27 March 2005[a]	58	13	2,848	0.63	20.4	MWC[b]
14–18 March 2006[a]	78	19	2,764	0.66	28.2	MWC
18–22 March 2008[a]	51	n/a	2,844	0.64	17.9	MWC
12–14 March 2011	69	19	4,368	0.55	15.8	MWC
22–26 March 2012	67	17	4,752	0.65	14.1	IAWS[c]

[a] Source: Data from U.S. Fish and Wildlife Service–Kanuti National Wildlife Refuge.
[b] MWC = minimum wolf count survey (Gardner and Pamperin 2014).
[c] IAWS = intensive aerial wolf survey (Gardner and Pamperin 2014).

ACTIVITY 1.3. Using survey results and other methods, estimate Unit 24 wolf population abundance (objective M1).

Data Needs

An estimate of wolf abundance is needed to establish that a minimum number of wolves persist in Unit 24 in order 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 estimate of the Unit 24 wolf population will be composed of statistical estimates (activity 1), minimum counts from aerial wolf surveys (activity 2), 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

The estimated population densities reported in the last reporting period were highest (25–38 wolves/1,000 mi^2; 9–15 wolves/1,000 km^2) and probably 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). Wolf densities were lowest in central Unit 24B and 24C (remainder area; 10–15 wolves/1,000 mi^2; 4–6 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 1 July 2010–30 June 2015.

Unit 24D was not surveyed during 1 July 2010–30 June 2015. The results of the 1999 and 2000 surveys are reported in Stout (2003). The 2000 SUPE survey in Unit 24D indicated there were 148 wolves (±32, 90% CI) in the 4,175 mi^2 survey area, a density of 36 wolves/1,000 mi^2 (14 wolves/1,000 km^2); the survey results may have been biased high by the presence of several packs that were on the perimeter of the survey area. The fall population composite estimate for all of Unit 24 was 375–557 wolves in 56–68 packs during RY10–RY14 and has probably changed little since RY96–RY97 (Stout 2003).

Radiotelemetry of wolves in a study 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) we 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 (4,643 mi^2) that was not part of that study, 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). Using the 2012 IAWS results and the minimum counts from

Table 2. Unit 24 composite estimate of wolf abundance, Interior Alaska, regulatory years[a] 2010–2014.

Estimated area	Area size (mi^2)	Density (wolves/1,000 mi^2)	Estimated number	Data source(s)	Type of estimate
Northern Unit 24 – Brooks Range portion of Units 24A and 24B					
GAAR[b]	5,775	11.7–17.1	68–99	Adams et al. 2008	TMR[c]
Remainder	4,643	15–21	70–98	Adams et al. 2008/Unit 24B–IAWS[d]/MWC[e]	Extrapolated
Subtotal	10,418	13.2–18.9[f]	138–197[g]		Composite
Central Unit 24 – Units 24B remainder and 24C					
Kanuti and IM[h] area	4,752	10–15	48–71	ADF&G[i]/USFWS[j] memos	IAWS/MWC
Remainder	5,548	10–15	55–84	ADF&G/USFWS memos	Extrapolated
Subtotal	10,300	10–15[f]	103–155[g]		Composite
Southern Unit 24 – Unit 24D					
2000 SUPE[k] survey	4,175	27.7–43.1	115.6–180.0	ADF&G memo	SUPE–Statistical
Remainder	1,175	15–21	18–25	Adams et al. 2008/Unit 24B–IAWS/MWC	Extrapolated
Subtotal	5,350	25–38[f]	134–205[g]		Composite
Total	26,068	14.4–21.4[f]	375–557[g]		Composite

[a] A regulatory year begins 1 July and ends 30 June, e.g., regulatory year 2010 = 1 July 2010–30 June 2011.
[b] GAAR = Gates of the Arctic National Park.
[c] TMR = territory mapping using radiotelemetry (Gardner and Pamperin 2014).
[d] IAWS = intensive aerial wolf survey (Gardner and Pamperin 2014).
[e] MWC = minimum wolf count survey (Gardner and Pamperin 2014).
[f] Estimated number of wolves divided by area size.
[g] Sum of column values.
[h] IM = intensive management.
[i] ADF&G = Alaska Department of Fish and Game.
[j] USFWS = U.S. Fish and Wildlife Service.
[k] SUPE = sample unit probability estimator (Becker et al. 1998, 2004).

the 4 surveys on the Kanuti NWR and extrapolating densities of similar habitats to the areas that were not surveyed, we estimate 103–155 wolves occur in Units 24B and 24C (10–15 wolves/1,000 mi^2; 4–6 wolves/1,000 km^2; 10,300 mi^2). In Unit 24D the 2000 SUPE statistical estimate indicated 147.8 wolves (± 32.2 wolves; 90% 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 the minimum counts from the 2005, 2006, 2008, and 2011 MWC surveys, the minimum count from the 2012 IAWS survey, literature values (Adams et al. 2008), and the 2000 SUPE statistical estimate.

Recommendations for Activity 1.3

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

Methods

Wolves harvested by trappers and hunters were sealed to monitor harvest. Harvest data were archived in a database accessible through WinfoNet and accessed 19 May 2015. Harvest is reported by regulatory year. Information recorded for each wolf included 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.

Season and Bag Limit

Units and Bag Limits	Resident Open Seasons	Nonresident Open Seasons
Unit 24		
HUNTING: 10 wolves.	10 Aug–30 Apr	10 Aug–30 Apr
TRAPPING: No limit.	1 Nov–30 Apr	1 Nov–30 Apr

Results and Discussion

Harvest by Hunters–Trappers

Hunters and trappers reported harvesting 24–79 wolves annually during RY10–RY14 (Table 3). The actual number harvested was probably higher because most village 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 RY10–RY14, travel conditions were generally very good, except in RY14 when very low snow accumulations contributed to rough trail conditions reported by some trappers. The increase in wolves harvested under same-day-airborne was a result of the department predator control program.

Harvest Chronology

Although the RY10–RY14 harvest chronology data are not typical, wolves are generally taken in December–March and the highest harvest is typically in February (Table 4). Because total harvest was low during RY10–RY14, it gives the impression that fall harvest has increased. Harvest in the fall was inconsistent during RY10–RY14, possibly due to incidental sightings during the fall moose hunting season.

Transport Methods

Most wolves were taken using snowmachines for transportation during RY10–RY14 (Table 5). However, because overall harvest declined among village trappers and hunters who did not use the road system, this resulted in an apparent shift in the percentage of wolves taken by highway vehicles in Unit 24, 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 was a result of the department predator control program.

Alaska Board of Game Actions and Emergency Orders

No changes were adopted, and no emergency orders were issued during the RY10–RY14 reporting period. In RY10, we presented to BOG an intensive management 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 villages of Alatna and Allakaket. The Alaska State Legislature approved funding for that IM program in RY11. BOG adopted an IM plan at their March 2012 meeting and the program, which includes aerial wolf control conducted by department personnel, began in RY12.

Recommendations for Activity 2.1

Continue this activity.

Table 3. Unit 24 wolf harvest, Interior Alaska, regulatory years[a] 2010–2014.

Regulatory year	Reported harvest				Estimate unreported harvest	Total estimated harvest	Method of take			
	M	F	Unk	Total			Trap–Snare	Shot	SDA[b]	Unk
2010	17	10	2	29	30	59	21	8	0	0
2011	13	17	4	34	30	64	26	8	0	0
2012	37	41	1	79	30	109	43	13	23	0
2013	4	17	3	24	30	54	16	7	0	1
2014	16	25	0	41	30	71	12	3	26	0

[a] A regulatory year begins 1 July and ends 30 June, e.g., regulatory year 2010 = 1 July 2010–30 June 2011.
[b] SDA = same-day-airborne. Animals taken by hunters the same day hunters or trappers were airborne.

Table 4. Unit 24 wolf percent harvest chronology by month, Interior Alaska, regulatory years[a] 2010–2014.

Regulatory year	Percent harvest chronology by month							
	Aug–Oct	Nov	Dec	Jan	Feb	Mar	Apr	*n*[b]
2010	31	0	24	14	17	14	0	29
2011	18	9	15	15	18	24	3	34
2012	6	13	14	23	8	27	10	79
2013	25	4	21	17	4	21	8	24
2014	2	7	5	17	2	66	0	41

[a] A regulatory year begins 1 July and ends 30 June, e.g., regulatory year 2010 = 1 July 2010–30 June 2011.
[b] Some reports did not report month of harvest.

Table 5. Unit 24 wolf percent harvest by transport method, Interior Alaska, regulatory years[a] 2010–2014.

	Percent harvest by transport method								
Regulatory year	Airplane	Dogsled, Skis, Snowshoes	Boat	3- or 4-Wheeler	Snowmachine	ORV[b]	Highway vehicle	Unk	*n*
2010	7	17	14	0	31	0	24	7	29
2011	35	6	6	0	44	0	9	0	34
2012	33	3	4	0	52	3	6	0	79
2013	8	4	8	0	54	0	25	0	24
2014	66	0	0	0	20	0	15	0	41

[a] A regulatory year begins 1 July and ends 30 June, e.g., regulatory year 2010 = 1 July 2010–30 June 2011.
[b] ORV = off-road vehicles.

ACTIVITY 2.2. Monitor wolf numbers and population characteristics through interviews with trappers, hunters, pilots, and by evaluation of sealing documents to evaluate harvest (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.

Methods

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 are collected and recorded each winter opportunistically. Wolf harvest is recorded and archived in Galena Area Office files. Harvest of wolves by trappers is compared to wolf sealing records to estimate the number of wolves that are likely unreported.

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, I estimate 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) (objective M1).

Data Needs

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

Input into the PredPrey model predator and prey abundance estimates, prey productivity data from survey data and reported literature, prey harvest estimates from species management

reports, and literature values of predation rates. Generate models to evaluate data gaps or identify potentially important factors that are influencing the population dynamics of wolves and their prey in Unit 24.

Initial model input included moose harvest of 15 bulls and 5 cows and predator populations of 25 grizzly bears (*Ursus arctos*) and 75 black bears (*U. americanus*) (with objectives of 20 grizzly bears and 60 black bears at stable abundance). We input an optional prey abundance of 5,000 caribou and 100 sheep with a maximum predation rate of 1%. Those input levels accounted for intermittent occurrence within the area or potential prey sources that wolves may utilize near the area. Adult moose biomass was set at 856,488 lb/1,000 mi^2 (150,000 kg/1,000 km^2), and nonpredator mortality rates were set at 5%, 2%, 6%, and 10% for adult males, adult females, yearlings, and calves, respectively. Since the actual moose population change within UKMA is expected to be small (absolutely and relatively); it thus may be difficult to detect at a relative precision of 25% at the 90% confidence level (Hayes et al. 2003). Nonetheless, it would represent an increase in the number of moose in UKMA which would represent progress toward achieving the IM population objective for moose in Unit 24B.

Results and Discussion

In February 2011, we generated a feasibility assessment for intensive management (http://www.adfg.alaska.gov/static/regulations/regprocess/gameboard/pdfs/2010-2011/3-4-central-sw/rcs/RC091.pdf), and in February 2012 we developed an operational plan for intensive management (http://www.adfg.alaska.gov/index.cfm?adfg=gameboard.meetinginfo&date=03-02-2012&meeting=fairbanks) utilizing the PredPrey model to evaluate predation on moose and forecast potential outcomes of wolf control. The feasibility assessment and operational plan for intensive management were approved for implementation by BOG.

By removing approximately 90% of the estimated pre-control wolf abundance in the UKMA portion of Unit 24B and maintaining that level (<6 wolves) for 5 winters (fall 2012–spring 2017), the PredPrey model (McNay and DeLong 1998) forecasted that the number of moose within UKMA would increase from approximately 405 (±97) moose in 2011 (prior to wolf control) to 600 moose in 5 years (2016).

Recommendations for Activity 2.3

Continue to improve modeling of wolf populations and their effect on prey populations. Update modeling parameters when new information is available.

ACTIVITY 2.4. Conduct trapper education clinics (objective M2).

Data Needs

None. Clinics are not a data gathering effort, they are a public education effort.

Methods

Organize trapper education clinics with a focus on wolf snaring methods. Snaring clinics provided information on building wolf snares, effective sets, snare locations that prevented 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 RY10–RY14.

Recommendations for Activity 2.4

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

3. Habitat Assessment–Enhancement

None.

NONREGULATORY MANAGEMENT PROBLEMS OR NEEDS

Data Recording and Archiving

- Wolf survey memos are stored in the office file cabinets of the Galena Area Biologist and electronic copies of those memos are stored on the hard drive of the Galena Area Biologist in the wolf surveys files.
- Harvest data are stored on a database housed on an internal server (https://winfonet.alaska.gov/index.cfm).
- Electronic copies of survey memos, survey data, and maps are also stored in the WinfoNet – Data Archive. Project Title: Unit 24 Wolf. Primary Region: Region III
- Hard copies of field data sheets, paper files, hard copies, etc. are located in the file cabinet located in the Galena Area Biologist's office.

Agreements

None.

Permitting

None.

Conclusions and Management Recommendations

The Unit 24 wolf population was probably stable during RY10–RY14 and has changed little since RY93, with some localized annual fluctuations. Wolf numbers were highest (25–38 wolves/1,000 mi^2; 9–15 wolves/1,000 km^2) and probably stable in southern Unit 24 (Unit 24D). Wolf populations were moderate in northern Unit 24 (Brooks Range portion of Units 24A and 24B; 13–19 wolves/1,000 mi^2; 6–8 wolves/1,000 km^2). Wolf populations were lowest in central Unit 24 (10–15 wolves/1,000 mi^2; 4–6 wolves/1,000 km^2)

Based on the Unit 24 composite estimate of 375–557 wolves (14.4–21.4 wolves/1,000 mi^2; 5.6–8.3 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 71.4 wolves RY10–RY14, harvest objective M2 (112–162 wolves) was met because the population could

support a harvest of at least 107–160 wolves. 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 RY10–RY14, as a result of decreased demand but not due to population reductions. Harvest monitoring was an important part of the wolf management program. Monitoring included the statewide sealing system and trapper interviews.

We do not expect 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 a management action.

II. Project Review and RY15–RY19 Plan

Review of Management Direction

MANAGEMENT DIRECTION

The existing management direction and goals appropriately direct management of wolves in Unit 24. 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 the long-term sustainability of the wolf population or that statewide goals (ADF&G 2002) for human uses cannot be met; therefore, the Unit 24 management direction should continue to be that wolves will be managed in a manner that complements the statewide wolf management goals. There are no area-specific issues in Unit 24 that require a departure from statewide goals for wolf management.

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.

CODIFIED OBJECTIVES

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

Unit 24 has a positive customary and traditional use finding for wolves, as determined 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.

Amounts Reasonably Necessary for Subsistence Uses

C1. Unit 24 has a positive customary and traditional use finding for wolves, as determined by BOG, with an amount necessary for subsistence uses of 90% of the harvestable portion.

Intensive Management

Unit 24B: 100–140 wolves.

MANAGEMENT OBJECTIVES

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

We will maintain this management objective. This population density range is consistent with the long-term sustainability for wolf densities published in the 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, National Wildlife Refuge and National Park Service land management policies play an important role in Unit 24, and generally 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.

We will maintain this management objective. 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 Conduct minimum wolf count (MWC; Gardner and Pamperin 2014) survey 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 in order to determine that at least 100 wolves occupy Unit 24B as required by the predator control plan in Alaska Administrative Code 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 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 abundance estimate 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 number of wolves needed for a long-term sustainable population. Minimum wolf counts 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

RY15–RY19

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 completed in RY17 if a SUPE survey is not completed. An MWC survey will be planned as the first option in RY15, RY16, RY18, and RY19.

In RY17, in the final year of the IM program funding, a minimum estimate of wolves must be completed 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 approximately a 50% reduction from the pre-control population and 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.

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

Data Needs

An estimate of the Unit 24 wolf population will need 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 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.

Methods

RY15, RY17, and RY19

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. Monitor harvest through sealing records (objective M2).

Data Needs

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

Methods

RY15–RY19

Wolves harvested by trappers and hunters will continue to be sealed to monitor harvest. Fursealing 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 fursealing data should be limited to general assessment of dramatic changes and probable causes for those variations. Generalized assessments (higher/stable/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 assessment 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, we will consider management strategies to provide greater harvest opportunity for wolves.

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 in order to establish that the population is not being harvested in excess of sustained yield.

Methods

RY15–RY19

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

each regulatory year. 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. 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 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, we 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.

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 we conduct a clinic we will follow up to evaluate trapping effort and success among participants in harvesting wolves.

Methods

Resume clinics upon completion of the Unit 24B IM program. Organize 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

None.

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 location data will be logged using WGS 84 datum. Global Positioning System 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 intensive management operational plan for Wolf – Unit 24 will be stored in the Fairbanks Regional Office Library and online at http://www.adfg.alaska.gov/index.cfm?adfg=librarypublications.wildlifemanagement. 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

The Cooperative Agreement, COOP-12-103, Alaska Department of Fish and Game and Allakaket Tribal Council, Disposition of Wolf Carcasses, is found on Galena Office hard drive, in the Intensive Management file.

The K'oyitl'ots'ina Limited (KCorp) – Surface Use Access Agreement – 2014, is found on Galena Office hard drive, in the Intensive Management file.

The Doyon Limited – Request for Surface Use Access Agreement – 2014, is found on Galena Office hard drive, in the Intensive Management file.

Permitting

The Bureau of Land Management Access Permit, is found on Galena Office hard drive, in the Intensive Management file.

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

The Commissioner's Delegation of Authority for Predator Control – 2015 Renewal is found on Galena Office hard drive, in the Intensive Management file.

The Wolf Control Operating Protocol for Intensive Management activities in Unit 24B is found on the Galena Office hard drive, in the Intensive Management file.

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Appendix. Wolf census form.

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									


ALASKA
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