Wolf Management Report and Plan, Game Management Units 20A, 20B, 20C, 20F, and 25C:

Report Period 1 July 2010–30 June 2015, and

Plan Period 1 July 2015–30 June 2020

Donald D. Young, Jr.

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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.

Species management reports and plans are available via the Alaska Department of Fish and Game's website (www.adfg.alaska.gov) or by contacting Alaska Department of Fish and Game, Division of Wildlife Conservation, PO Box 115526, Juneau, AK 99811-5526; phone: (907) 465-4190; email: dfg.dwc.publications@alaska.gov. The report may also be accessed through most libraries, via interlibrary loan from the Alaska State Library or the Alaska Resources Library and Information Services (www.arlis.org).

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Purpose of this Report

This report provides a record of survey and inventory management activities for wolves (*Canis lupus*) in Units 20A, 20B, 20C, 20F, and 25C 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

The Fairbanks Area is located in central Interior Alaska and encompasses the lower Tanana Valley and central Yukon Valley and includes the Alaska Range, White Mountains, Ray Mountains, Tanana Hills, Tanana Flats and Minto Flats ecoregions (ADF&G 1976). Maps for the Fairbanks Area 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 Units 20A, 20B, 20C, 20F, and 25C

Wolf population size and harvest have varied considerably, both spatially and temporally, within this management area (Gasaway et al. 1983; Boertje et al. 1996; Young 2009). Wolf numbers are primarily regulated by prey availability, but wolf control and harvest have periodically reduced wolf populations in portions of the management area. The annual wolf harvest is influenced by wolf numbers and hunter–trapper access.

Human consumptive use of caribou (*Rangifer tarandus*), moose (*Alces alces*), and Dall sheep (*Ovis dalli*) has been a dominant interest among Alaska residents. To enhance the harvestable surplus of ungulates, ADF&G conducted wolf predation control programs in Units 20A (autumn 1975–spring 1982 and October 1993–November 1994) and 20B (autumn 1979–spring 1986). The program in 1993–1994 in Unit 20A was implemented to reverse a caribou population decline associated with a density-dependent response to 4 consecutive winters (i.e., 1989–1990 through 1992–1993) with above average snowfall. The most recent program (2006–2011) in eastern Units 20B and 25C was implemented to increase Fortymile caribou herd numbers.

Within Denali National Park and Preserve (DNP&P) in Unit 20C, a nearly 20-year wolf study continues because of interest in the wolf as a predator, wilderness symbol, and fundamental

component of a naturally regulated system (Adams et al. 1995; Mech et al. 1995; Meier et al. 1995; Meier 2011). In addition, trappers continue the long tradition of harvesting this economically and culturally significant furbearer.

Management Direction

ADF&G will manage wolf populations to provide for human uses and to 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 purposes (ADF&G 2002). The aesthetic value of being aware of or observing wolves in their natural environment is also recognized as an important human use of wolves.

We also recognize that integral to wolf management is the premise that wolf populations are renewable resources that can be harvested and manipulated to enhance human uses of other resources. Management may include both the manipulation of wolf population size and total protection of wolves from human influence.

Existing Wildlife Management Plans

None presently specific to wolves. Direction in the central Alaska Range wolf management plan (ADF&G 1976) has been modified by Alaska Board of Game regulatory actions over the years.

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

Amounts Reasonably Necessary for Subsistence Uses

C1. Units 20A, 20B, and 25C outside the Fairbanks Nonsubsistence Area, and Units 20C and 20F have a positive customary and traditional use finding for moose, as determined the board, with an amount necessary for subsistence uses 90% of the harvestable portion.

Intensive Management

None.

Management Objectives

M1. Manage for fall density ≥11 wolves/1,000 mi^2 (4.2 wolves/1,000 km^2).

Management Activities

Methods for data collection and results for all activities during RY10 are found in Young (2012).

1. Population Status and Trend

ACTIVITY 1.1. Conduct sample unit probability estimator (SUPE) (Becker et al. 1998, 2004) in Unit 20A and northeastern Unit 20C to estimate wolf abundance (objective 1).

Data Needs

- Units 20A, 20B, 20C, 20F, and 25C (Fairbanks Area): Abundance estimate to evaluate management objective of ≥11 wolves/1,000 mi^2 (4.2 wolves/1,000 km^2).
- Units 20A and 20C: Wolf abundance in relation to intensive management of moose and caribou.

Methods

Unit estimates of numbers of wolves and packs during RY10–RY14 were based on extrapolations from earlier or adjacent surveys, i.e., wolf research studies (Unit 20A; McNay 2002; McNay and Ver Hoef 2003), reconnaissance surveys (Unit 20A; Young 2009, 2012), SUPE (Units 20A and 20C; Appendices A–C), and radiotelemetry surveys in DNP&P (Unit 20C; Meier 2011). Unit estimates were combined to obtain an areawide (Fairbanks Area) estimate.

We conducted wolf population estimates (SUPE) in northeastern Unit 20C during spring 2012 (Appendix A), northern Unit 20A during spring 2013 (Appendix B), and all of Unit 20A during spring 2015 (Appendix C) following the sampling assumptions described in Becker et al. (1998, 2004) and Patterson et al. (2004).

Results and Discussion

Areawide, we estimated approximately 628–963 wolves in 83–132 packs in fall 2010–2014. The ranges represent the combined minimum and maximum estimates for each unit (Table 1). This estimate results in an estimated wolf density of 16–25 wolves/1,000 mi^2 (6–9 wolves/1,000 km^2) and exceeds our objective of a fall density ≥11 wolves/1,000 mi^2 (4.2 wolves/1,000 km^2).

Table 1. Units 20A, 20B, 20C, 20F, and 25C fall wolf population estimates, Interior Alaska, 2010–2014.

Unit	Year	Population estimate[a]	Number of packs	Basis of estimate
20A	2010	224–229	25–27	Extrapolation from 2008
	2011	224–229	25–27	Extrapolation from 2008
	2012	339	25–27	SUPE northern portion of Unit 20A[b]
	2013	259	27	Midpoint between 2012 and 2014
	2014	179	24	SUPE of entire Unit 20A[c]
20B	2010	150–225	20–30	Extrapolation from 1989 and Unit 20B West (1990)
	2011	150–225	20–30	Extrapolation from 1989 and Unit 20B West (1990)
	2012	150–225	20–30	Extrapolation from 1989 and Unit 20B West (1990)
	2013	150–225	20–30	Extrapolation from 1989 and Unit 20B West (1990)
	2014	150–225	20–30	Extrapolation from 1989 and Unit 20B West (1990)
20C	2010	165	18	Density/mean pack size extrapolation from DNP&P (Meier 2011)
	2011	149	21–35	DNP&P/ADF&G data north east Unit 20C (2012)[d], extrapolation remainder of unit
	2012	149	21–35	DNP&P/ADF&G data north east Unit 20C (2012)[d], extrapolation remainder of unit
	2013	149	21–35	DNP&P/ADF&G data north east Unit 20C (2012)[d], extrapolation remainder of unit
	2014	149	21–35	DNP&P/ADF&G data north east Unit 20C (2012)[d], extrapolation remainder of unit
20F	2010	75–125	10–20	Density extrapolation from Units 20C (1989) and 20B (1990)
	2011	75–125	10–20	Density extrapolation from Units 20C (1989) and 20B (1990)
	2012	75–125	10–20	Density extrapolation from Units 20C (1989) and 20B (1990)
	2013	75–125	10–20	Density extrapolation from Units 20C (1989) and 20B (1990)
	2014	75–125	10–20	Density extrapolation from Units 20C (1989) and 20B (1990)
25C	2010	75–125	10–20	Density extrapolation from Units 20C (1989) and 20B (1990)
	2011	75–125	10–20	Density extrapolation from Units 20C (1989) and 20B (1990)
	2012	75–125	10–20	Density extrapolation from Units 20C (1989) and 20B (1990)
	2013	75–125	10–20	Density extrapolation from Units 20C (1989) and 20B (1990)
	2014	75–125	10–20	Density extrapolation from Units 20C (1989) and 20B (1990)

[a] Includes an additional 10% to account for wolves not in packs.
[b] Appendix B, this document.
[c] Appendix C, this document.
[d] Appendix A, this document.

The wolf population status and trend differs between these units. For example, since the mid-1990s wolf abundance in Unit 20A differed substantially from that in Unit 20C. It appears that a combination of harvest, natural mortality, and emigration (Adams et al. 2008) limit wolf densities (~35 wolves/1,000 mi^2; ~14 wolves/1,000 km^2) in Unit 20A. By contrast, researchers in DNP&P have documented much lower wolf numbers in southern Unit 20C likely due to the decline of the Denali caribou herd (L. G. Adams, USGS Biological Resources Division, personal communication, 2003). The wolf population fluctuated between 48 and 68 wolves (7–10 wolves/1,000 mi^2; 3–4 wolves/1,000 km^2) during spring 2011–2015. The 2012 wolf census results in northeastern Unit 20C also reflected low wolf numbers (10.7 wolves/1,000 mi^2; 4.1 wolves/1,000 km^2).

Unit 20A (2013 and 2015): See Appendices B and C.

Unit 20C (2012): See Appendix A.

Recommendations for Activity 1.1

Discontinue SUPE surveys. Instead, monitor wolf population and status (i.e., wolf abundance) via harvest monitoring.

2. Mortality–Harvest Monitoring and Regulations

ACTIVITY 2.1. Monitor harvest through sealing records (objective 1).

Data Needs

Access wolf database stored on ADF&G's Wildlife Information Network (WinfoNet) annually and query wolf fur sealing data for Units 20A, 20B, 20C, 20F, and 25C.

Methods

Wolves harvested by trappers and hunters were sealed to monitor harvest. Harvest data were archived in the wolf database accessible through WinfoNet. 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.

Results and Discussion

Harvest by Hunters–Trappers

During RY10–RY14, areawide average annual wolf harvest was 191 wolves ranging from 156 wolves in RY10 to 223 wolves in RY12 (Table 2). Annual wolf harvests varied among years. These oscillations were not likely related as much to fluctuations in wolf numbers, but rather to other unidentified factors that affected trappers (e.g., weather, snow conditions, trapping pressure).

Areawide, the number of successful hunters and trappers ranged from 77 in RY10 to 92 in RY12 (Table 2). The number of wolves taken per successful hunter–trapper averaged 2.2 wolves/ hunter–trapper and varied little among years.

Harvest Chronology

Areawide, most wolves were harvested during November–March (Table 3). Most of the remainder of the harvest was during September–October. August and April accounted for only a small portion of the harvest. Although these trends were apparent in all units, the more remote units (i.e., Units 20C, 20F, and 25C) exhibited greater annual variability probably because of smaller sample sizes.

Method of Take and Transport Methods

Areawide, snaring continued as the leading method of take (except for RY14) followed closely by trapping (Table 2). The snowmachine has been by far the most successful type of transportation used to take wolves (Table 4). Generally, these trends were apparent for all units.

Other Mortality

Portions of Units 20B and 25C were in the Upper Yukon–Tanana Wolf Predation Control Area for the Fortymile caribou herd. During RY10–RY14, 46 wolves (35 by ADF&G) in Unit 20B and 70 wolves (35 by ADF&G) in Unit 25C, respectively, were reported taken by aerial wolf control in this area.

Recommendations for Activity 2.1

Continue.

3. Habitat Assessment–Enhancement

None.

Table 2. Units 20A, 20B, 20C, 20F, and 25C wolf harvest, Interior Alaska, regulatory years[a] 2010–2014.

		Reported harvest[b]						Method of take[c]								Successful	
Unit	Regulatory year	M	F	(%)	Unk	Total	5-Year mean	Trap	(%)	Snare	(%)	Shot	%	Unk–Other		Trappers–hunters	Wolves/person
20A	2010	21	13	(38)	7	41	51	15	(37)	17	(41)	9	(22)	0		20	2.1
	2011	19	19	(50)	3	41	46	11	(28)	15	(38)	14	(35)	1		23	1.8
	2012	19	29	(60)	0	48	47	15	(31)	21	(44)	12	(25)	0		21	2.3
	2013	18	27	(60)	0	45	45	21	(47)	14	(31)	10	(22)	0		20	2.3
	2014	16	20	(56)	0	36	42	19	(53)	14	(39)	3	(8)	0		17	2.1
20B	2010	28	32	(53)	0	60	67	26	(45)	26	(45)	6	(10)	2		27	2.2
	2011	32	39	(55)	7	78	73	25	(35)	31	(43)	16	(22)	6		35	2.2
	2012	59	47	(44)	3	109	83	35	(36)	51	(52)	12	(12)	11		40	2.7
	2013	59	41	(41)	0	100	83	24	(32)	35	(46)	17	(22)	24		37	2.7
	2014	41	39	(49)	0	80	85	42	(57)	24	(32)	8	(11)	6		39	2.1
20C	2010	14	15	(52)	1	30	29	11	(37)	15	(50)	4	(13)	0		15	2.0
	2011	10	5	(33)	1	16	28	6	(38)	7	(44)	3	(19)	0		13	1.2
	2012	12	4	(25)	0	16	24	8	(50)	4	(25)	4	(25)	0		11	1.5
	2013	13	7	(35)	3	23	23	8	(35)	10	(43)	5	(22)	0		14	1.6
	2014	12	7	(37)	0	19	21	4	(21)	11	(58)	4	(21)	0		15	1.3
20F	2010	3	2	(40)	0	5	7	2	(40)	1	(20)	2	(40)	0		5	1.0
	2011	5	7	(58)	1	13	8	3	(23)	6	(46)	4	(31)	0		7	1.9
	2012	5	6	(55)	0	11	9	3	(27)	6	(55)	2	(18)	0		6	1.8
	2013	2	4	(67)	0	6	10	2	(33)	0	(0)	4	(67)	0		6	1.0
	2014	12	7	(37)	0	19	11	7	(37)	8	(42)	4	(21)	0		9	2.1
25C	2010	10	10	(50)	0	20	18	0	(0)	12	(75)	4	(25)	4		10	2.0
	2011	20	13	(39)	2	35	23	12	(50)	11	(46)	1	(4)	11		7	5.0
	2012	24	15	(38)	0	39	27	4	(24)	10	(59)	3	(18)	22		14	2.8
	2013	18	10	(36)	0	28	27	3	(18)	9	(53)	5	(29)	11		12	2.3
	2014	10	17	(63)	11	38	32	3	(19)	8	(50)	5	(31)	22		11	3.5
Combined	2010	76	72	(49)	8	156	172	54	(36)	71	(47)	25	(17)	6		77	2.0
	2011	86	83	(49)	14	183	178	57	(35)	70	(42)	38	(23)	18		85	2.2
	2012	119	101	(46)	3	223	191	65	(34)	92	(48)	33	(17)	33		92	2.4
	2013	110	89	(45)	3	202	188	58	(35)	68	(41)	41	(25)	35		89	2.3
	2014	91	90	(50)	11	192	191	75	(46)	65	(40)	24	(15)	28		91	2.1

[a] Regulatory year begins 1 July and ends 30 June, e.g., regulatory year 2010 = 1 July 2010–30 June 2011.
[b] Unknown sex not used to calculate harvest percent.
[c] Unknown method of take not used to calculate harvest percent.

Table 3. Units 20A, 20B, 20C, 20F, and 25C wolf harvest chronology, Interior Alaska, regulatory years[a] 2010–2014.

Unit	Regulatory year	Harvest periods[b] Aug (%)	Sep–Oct (%)	Nov–Dec (%)	Jan–Feb (%)	Mar (%)	Apr (%)	Unk	*n*
20A	2010	1 (2)	4 (10)	3 (7)	13 (32)	19 (46)	1 (2)	0	41
	2011	2 (5)	9 (22)	15 (37)	8 (20)	7 (17)	0 (0)	0	41
	2012	5 (10)	7 (15)	8 (17)	25 (52)	3 (6)	0 (0)	0	48
	2013	4 (9)	4 (9)	4 (9)	25 (56)	7 (16)	1 (2)	0	45
	2014	0 (0)	1 (3)	11 (31)	18 (50)	6 (17)	0 (0)	0	36
20B	2010	1 (2)	6 (10)	20 (33)	17 (28)	14 (23)	2 (3)	0	60
	2011	1 (1)	11 (14)	21 (27)	28 (36)	14 (18)	2 (3)	1	78
	2012	0 (0)	9 (8)	28 (26)	45 (41)	26 (24)	1 (1)	0	109
	2013	0 (0)	13 (13)	16 (16)	41 (41)	26 (26)	3 (3)	1	100
	2014	1 (1)	5 (6)	26 (33)	34 (43)	13 (16)	1 (1)	0	80
20C	2010	0 (0)	3 (10)	6 (21)	7 (24)	11 (38)	2 (7)	1	30
	2011	0 (0)	1 (6)	3 (19)	8 (50)	1 (6)	3 (19)	0	16
	2012	0 (0)	2 (13)	1 (6)	11 (69)	1 (6)	1 (6)	0	16
	2013	0 (0)	5 (22)	5 (22)	13 (57)	0 (0)	0 (0)	0	23
	2014	0 (0)	1 (6)	3 (19)	9 (56)	2 (13)	1 (6)	3	19
20F	2010	0 (0)	1 (20)	3 (60)	0 (0)	1 (20)	0 (0)	0	5
	2011	0 (0)	0 (0)	4 (31)	8 (62)	1 (8)	0 (0)	0	13
	2012	1 (9)	1 (9)	0 (0)	2 (18)	7 (64)	0 (0)	0	11
	2013	0 (0)	1 (20)	1 (20)	2 (40)	0 (0)	1 (20)	1	6
	2014	0 (0)	1 (5)	3 (16)	5 (26)	3 (16)	7 (37)	0	19
25C	2010	2 (10)	1 (5)	2 (10)	4 (20)	2 (10)	9 (45)	0	20
	2011	1 (3)	0 (0)	4 (11)	19 (54)	11 (31)	0 (0)	0	35
	2012	0 (0)	2 (5)	2 (5)	8 (21)	26 (67)	1 (3)	0	39
	2013	2 (7)	1 (4)	0 (0)	15 (54)	9 (32)	1 (4)	0	28
	2014	1 (3)	3 (8)	1 (3)	11 (29)	22 (58)	0 (0)	0	38
20A, 20B, 20C, 20F, and 25C	2010–2014	22 (2)	92 (10)	190 (20)	376 (40)	232 (24)	37 (4)	7	956

[a] Regulatory year begins 1 July and ends 30 June, e.g., regulatory year 2010 = 1 July 2010–30 June 2011.

[b] Unknown harvest period not used to calculate harvest percent.

Table 4. Units 20A, 20B, 20C, 20F, and 25C wolf harvest by transport method, Interior Alaska, regulatory years[a] 2010–2014.

		Harvest by transport method[b]																	
Unit	Regulatory year	Airplane	(%)	Dog sled, skis, snowshoe, or horse	(%)	Boat	(%)	3- or 4-wheeler	(%)	Snowmachine	(%)	ORV[c]	(%)	Highway vehicle	(%)	Unk	*n*
20A	2010	3	(7)	3	(7)	0	(0)	3	(7)	31	(76)	1	(2)	0	(0)	0	41
	2011	8	(20)	7	(17)	0	(0)	0	(0)	24	(59)	0	(0)	2	(5)	0	41
	2012	12	(25)	1	(2)	0	(0)	6	(13)	27	(56)	0	(0)	2	(4)	0	48
	2013	9	(20)	0	(0)	0	(0)	1	(2)	35	(78)	0	(0)	0	(0)	0	45
	2014	2	(6)	0	(0)	0	(0)	1	(3)	32	(89)	0	(0)	1	(3)	0	36
20B	2010	4	(7)	1	(2)	1	(2)	2	(3)	49	(82)	0	(0)	3	(5)	0	60
	2011	9	(12)	1	(1)	4	(5)	6	(8)	47	(62)	0	(0)	9	(12)	2	78
	2012	16	(15)	2	(2)	0	(0)	2	(2)	79	(72)	0	(0)	10	(9)	0	109
	2013	32	(32)	2	(2)	3	(3)	7	(7)	48	(48)	0	(0)	8	(8)	0	100
	2014	8	(10)	4	(5)	1	(1)	2	(3)	58	(73)	0	(0)	6	(8)	1	80
20C	2010	13	(43)	2	(7)	0	(0)	0	(0)	14	(47)	0	(0)	1	(3)	0	30
	2011	2	(13)	1	(6)	0	(0)	0	(0)	13	(81)	0	(0)	0	(0)	0	16
	2012	2	(13)	3	(19)	0	(0)	0	(0)	10	(63)	1	(6)	0	(0)	0	16
	2013	2	(9)	1	(4)	1	(4)	4	(17)	15	(65	0	(0)	0	(0)	0	23
	2014	4	(22)	0	(0)	1	(6)	2	(11)	10	(56)	1	(6)	0	(0)	1	19
20F	2010	0	(0)	1	(20)	1	(20)	0	(0)	3	(60)	0	(0)	0	(0)	0	5
	2011	0	(0)	0	(0)	0	(0)	0	(0)	8	(62)	0	(0)	5	(38)	0	13
	2012	6	(55)	1	(9)	0	(0)	0	(0)	3	(27)	0	(0)	1	(9)	0	11
	2013	0	(0)	0	(0)	0	(0)	0	(0)	1	(17)	0	(0)	5	(83)	0	6
	2014	2	(11)	0	(0)	0	(0)	2	(11)	14	(74)	0	(0)	1	(5)	0	19
25C	2010	10	(50)	1	(5)	0	(0)	1	(5)	8	(40)	0	(0)	0	(0)	0	20
	2011	11	(31)	0	(0)	0	(0)	1	(3)	23	(66)	0	(0)	0	(0)	0	35
	2012	24	(62)	1	(3)	0	(0)	1	(3)	11	(28)	0	(0)	2	(5)	0	39
	2013	12	(43)	0	(0)	1	(4)	1	(4)	11	(39)	1	(4)	2	(7)	0	28
	2014	22	(58)	1	(3)	2	(5)	1	(3)	11	(29)	0	(0)	1	(3)	0	38
20A, 20B, 20C, 20F, and 25C	2010–2014	213	(22)	33	(3)	15	(2)	43	(5)	585	(61)	4	(0)	59	(6)	4	956

[a] Regulatory year begins 1 July and ends 30 June, e.g., regulatory year 2010 = 1 July 2010–30 June 2011.
[b] Unknown transport not used to calculate harvest percent.
[c] ORV = off-road vehicle.

Nonregulatory Management Problems or Needs

Data Recording and Archiving

RECORDING

- Wolf survey form (Appendices B and C).

ARCHIVING

- Harvest data are stored on a database housed on an internal server (http://winfonet.alaska.gov/index.cfm).
- All other electronic data and files such as survey memos and reports are located on the computer (C:\Users\ddyoung\Documents\Wolf\) in the Fairbanks Area Biologist office (Room 120) and regional office server (S:\FAIRBANKS AREA\Wolf\). Field data sheets, paper files, hard copies, etc. are located in the file cabinet located in Fairbanks Area Biologist office.
- In addition, electronic copies of survey memos, survey data, and maps will be stored in the WinfoNet Data Archive. Project Title: Fairbanks Area. Primary Region: Region III.

Agreements

None.

Permitting

None.

Conclusions and Management Recommendations

The areawide estimated wolf density of 16–25 wolves/1,000 mi^2 (6–9 wolves/1,000 km^2) during RY10–RY14 met our management objective of a fall density ≥11 wolves/1,000 mi^2 (≥4.2 wolves/1,000 km^2).

The department recommends maintaining areawide wolf seasons and bag limits to further evaluate harvest trends and trapping effort. However, regarding the trapping season that extends through April and hunting season that extends through May, concerns over fur quality and the pregnancy status of adult females will probably continue to generate public proposals. Because trappers take so few wolves in April and hunters even fewer wolves in May, little biological rationale exists for or against these late seasons. Similarly, there was no biological rationale for the wolf buffer in the Nenana Canyon and Stampede areas in Units 20A and 20C, which the Board of Game eliminated in March 2010. However, the social controversy surrounding this issue (i.e., consumptive vs. nonconsumptive use) of wolves within the area continues to exist and likely will be the impetus for future proposals.

II. Project Review and RY15–RY19 Plan

Review of Management Direction

Management Direction

ADF&G will manage wolf populations to provide for human uses and to 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 purposes (ADF&G 2002). The aesthetic value of being aware of or observing wolves in their natural environment is also recognized as an important human use of wolves.

We also recognize that integral to wolf management is the premise that wolf populations are renewable resources that can be harvested and manipulated to enhance human uses of other resources. Management may include both the manipulation of wolf population size and total protection of wolves from human influence.

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

Amounts Reasonably Necessary for Subsistence Uses

C1. Units 20A, 20B, 20C, 20F, and 25C outside the Fairbanks nonsubsistence area have a positive customary and traditional use finding for moose, as determined the board, with an amount necessary for subsistence uses 90% of the harvestable portion.

Intensive Management

None.

Management Objectives

The 1 July 2010–30 June 2015 density-based objective (objective M1 in report section) will be replaced with the harvest-based objective below. Obtaining reliable density estimates for wolf populations at the unit scale is problematic (e.g., sightability issues in some units, meeting minimum survey condition requirements; funding constraints). We recommend using harvest

data obtained from sealing records to monitor wolf abundance at the unit scale in the Fairbanks Area.

M1. Manage for annual reported harvests in at least 1 of every 2 consecutive years:

a) Unit 20A ≥33 wolves[a]

b) Unit 20B ≥48 wolves[a]

c) Unit 20C ≥14 wolves[a]

d) Unit 20F ≥3 wolves[a]

e) Unit 25C ≥12 wolves[a]

[a] Minimum reported harvest RY05–RY14.

Review of Management Activities

1. Population Status and Trend

No activities specifically related to monitoring population and trend are planned.

2. Mortality–Harvest Monitoring

ACTIVITY 1.1. Monitor harvest through sealing records (objectives M1:a–e).

Data Needs

Wolf harvest data obtained from sealing records are needed to monitor wolf abundance at the Unit scale in the Fairbanks Area.

Methods

RY15–RY19

Wolves harvested by trappers and hunters will continue to be sealed to monitor harvest. We will access the wolf database through WinfoNet annually and query wolf fur sealing data for Units 20A, 20B, 20C, 20F and 25C to compare to the management objectives.

3. Habitat Assessment–Enhancement

None.

Nonregulatory Management Problems or Needs

None.

Data Recording and Archiving

- Wolf harvest (fur sealing) data will be archived in a database accessible through WinfoNet.

- Electronic data and files such as survey memos and reports will also be stored in the WinfoNet – Data Archive. Project Title: Fairbanks Area Office. Primary Region: Region III.

Agreements

None.

Permitting

None.

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Adams, L. G., B. W. Dale, and L. D. Mech. 1995. Wolf predation on caribou calves in Denali National Park, Alaska. Pages 245–260 [*In*] L. N. Carbyn, S. H. Fritts, and D. R. Seip, editors. Ecology and Conservation of Wolves in a Changing World. Canadian Circumpolar Institute, Occasional Publication 35, Edmonton, Alberta, Canada.

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♦ ♦ ♦

Appendix A. Unit 20C wolf census memorandum, Interior Alaska, 2012.

STATE OF ALASKA

DEPARTMENT OF FISH AND GAME

DIVISION OF WILDLIFE CONSERVATION

Sean Parnell, GOVERNOR

1300 College Road
Fairbanks, AK 99701-1599
PHONE: (907) 459-7213
FAX: (907) 452-6410

MEMORANDUM

TO:	Distribution	*DATE*:	June 16, 2012
THRU:		*TELEPHONE*:	459-7329
		FAX:	459-73320
FROM:	Craig Gardner and Nate Pamperin Division of Wildlife Conservation Fairbanks	*SUBJECT*:	Unit 20C wolf census

---

During 11-13 March 2012, we completed a wolf census in a 4,656 mi^2 (12,059 km^2) portion of Unit 20C (Figure 1). Survey timing coincided to the time of year when packs approach their lowest numbers (Burch et al. 2005). Our objective was to determine the number of wolves and packs to aid future management decisions. We followed the sampling assumptions described in Becker et al. (1998, 2004) and Patterson et al. (2004): 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. To meet these assumptions, we designed the census to be surveyed at an intensity of ≥ 0.8 minute/mi^2 (0.3 min/km^2; Becker et al. 1998). Survey time includes all time spent within the survey area either on transects or tracking wolves.

We subdivided the census area into 14 sample units ranging 320-352 mi^2. We further subdivided the survey units into 20-22 16mi^2 sample blocks to assist survey crews in assessing their area coverage. Prior to the survey, we explained to each survey crew the required sampling intensity and that transects were probably necessary in most areas to ensure adequate coverage. Following the first 2 days of surveying, we identified any sample blocks or portions of blocks that were missed due to localized inclement weather or because the crew tracked wolves through a portion of the area but did not return to complete the unit. We returned on day 3 to complete these areas.

Results: We initiated the census 5 days after a 6-12" snowfall and 2 days after a ≥ 25 mph (40 km) windstorm. Snow conditions were excellent. The superpopulation was 54 wolves, 4 of

which were singles. We found 2 other singles but additional track information collected on subsequent days verified these were members of known packs. The observation rate was 59.3%. We found 12 individual packs with an average pack size of 4.2 wolves (range = 2-10; SD = 2.94 wolves); 6 of the packs were pairs. Following the pack inclusion rule outlined in Becker et al. (1998), the estimated density was 4.1 wolves/1000 km^2 (10.7/1000 mi^2). Our density estimate does not include single wolves because the number of lone, transient wolves may vary widely throughout the year due to dispersal (Adams et al. 2008) and because ungulate kill rates by lone wolves compared to packs is much lower (Hayes 1977). Furthermore, the number of lone wolves is often higher during February and March when most young wolves are dispersing (Adams et al. 2008, Gardner et al. in press).

Survey intensity averaged 0.91 min/mi^2 (0.4 min/km^2, Table 1). Sampling intensities varied due to habitat type and the presence of wolves. Some sampling units consisted primarily of burned timber/shrubs due to the 2010 wildfires and could be surveyed from a higher altitude requiring fewer transects. Two – 4 transects were completed in each sample block except for 1 block located within the Clear Air Force restricted airspace (Figure 2). Also, more survey lines were completed in the southwest portion of the study area than mapped due to a malfunctioning GPS.

Local survey conditions varied during the 3-day survey. During day 1, survey conditions were excellent throughout the area, during day 2 the southern portion had varying but adequate light conditions and some wind in the higher terrain, and during day 3, light conditions were good but high winds were a factor. The survey was primarily completed during the first 2 days and on day 3, most or our effort was directed to check small areas that had received inadequate sampling. Overall, we rank the survey conditions as good. Cost to complete the census was about 20k.

Table 1. Survey intensity used to census wolves in a 4,656 mi^2 (12,059 km^2) portion of Unit 20C in Interior Alaska during 11-13 March 2012.

Area	Size (mi2)	Time (min)	Intensity	Tracks (Y/N)	# Packs	Pack Size	singles
E1	352	360	1.02	y	1	2	1
E2	336	350	1.04	y	1	2	1
E3	336	215	0.64	y	1	2	
E4	336	215	0.64	y	0	0	
E5	336	384	1.14	y	1	7	
E6	352	328	0.93	y	1	4	2
E7	336	392	1.17	y	2	2,7	
W1	320	267	0.83	y	1	5	
W2	320	236	0.74	n	0	0	
W3	320	345	1.08	y	1	5	
W4	352	436	1.24	y	1	2	
W5	320	239	0.75	y	1	10	
W6	320	201	0.63	y	1	2	
W7	320	295	0.92	n	0	0	
Totals	4656	4263	0.91		12	50	4

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Patterson, B. R., N. W. S. Quinn, E. F. Becker, and D. B. Meier. 2004. Estimating wolf densities in forested areas using network sampling of tracks in snow. Wildlife Society Bulletin 32:938-947.

Distribution:
Scott Brainerd
Tony Hollis
Mark Keech
Roy Nowlin
Brian Taras
Don Young

Appendix B. Unit 20A wolf sample unit probability estimator memorandum, Interior Alaska, 2014.

MEMORANDUM

State of Alaska

Department of Fish and Game
Division of Wildlife Conservation

TO: Doreen Parker McNeill
Management Coordinator RIII

DATE: August 15, 2014

THRU:

TELEPHONE: 459-7233

FROM: Don Young
Fairbanks Area Wildlife Biologist
Division of Wildlife Conservation
Fairbanks

SUBJECT: Wolf SUPE, Unit 20A, 2013

BACKGROUND

We conducted a wolf population estimate in Unit 20A to addresses the management objective to manage for a fall density ≥11 wolves/1,000 mi^2. In addition, moose and caribou populations in Unit 20A have been identified by the Board of Game as Intensive Management populations, thus monitoring the status and trend of the wolf population provides valuable information regarding the management of those populations.

METHODS

During 25-27 February and 1 March 2013, we completed a wolf population estimate in a 3,440 mi^2 (8909 km^2) portion of northcentral and northwest Unit 20A (Figure 1). Survey timing coincided to the time of year when packs approach their lowest numbers (Burch et al. 2005). Our objective was to determine the number of wolves and packs to aid future management decisions. We followed the sampling assumptions described in Becker et al. (1998, 2004) and Patterson et al. (2004): 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. To meet these assumptions, we designed the census to be surveyed at an intensity of ≥ 0.8 minute/mi^2 (0.3 min/km^2; Becker et al. 1998). Survey time includes all time spent within the survey area either on transects or tracking wolves.

We subdivided the census area into 215 16mi^2 high-density sample units (SUs) and sampled 83 (sample fraction = 0.386). Prior to the survey, we explained to each survey crew the required sampling intensity and that transects were probably necessary in most areas to ensure adequate coverage. Following the first 3 days of surveying, we identified any sample blocks or portions of

blocks that were missed due to localized inclement weather or because the crew tracked wolves through a portion of the area but did not return to complete the unit. We returned on 1 March to complete those areas. Observation data was recorded on a "Wolf SUPE Form" (Appendix A) and statistical computing was done in program "R" (Appendix B).

We intended to complete the remaining portion of Unit 20A during spring 2014, but snow conditions were unsatisfactory due to dramatic loss of snow cover during late January/early February accompanied by snow drought thereafter.

Results

We initiated the census 3 days after a significant snowfall. Snow conditions were adequate and survey conditions in general were considered good. Of 35 SUs where wolves or wolf tracks were observed and conditions rated, 34% were rated by observers as *Excellent*, 49% *Good*, 17% *Fair* and 0% *Poor*. Local survey conditions varied during the 4 days of surveying. The survey was mostly completed during the first 3 days (i.e., 25–27 February). The final day was mop up of 2 SUs (280 and 303) that were not able to be completed during the first 3 days and because of poor survey conditions on 28 February. Cost to complete the census was ~ $12k.

Survey intensity averaged 1.26 min/mi^2 (0.49 min/km^2, Appendix C). Sampling intensities varied due to habitat type and the presence of wolves.

We identified 121 individuals in 27 individual groups (mean = 4.48; range = 1–15; SE = 0.81); 4 observations were of wolf pairs and 9 of single wolves (Table 1). The population estimate was 156 wolves (95% CI = 119–193 wolves). The estimated percentage of wolves in groups was 89.4% and single wolves 10.5%. Following the pack inclusion rule outlined in Becker et al. (1998), the estimated density was 17.5 wolves/1000 km^2 (95% CI = 13.4–21.6 wolves/1000 km^2).

RECOMMENDATIONS

Conduct a unitwide SUPE in Unit 20A during spring 2015.

DATA ARCHIVING

Field forms, data sheets, maps and results will be saved on D. Young's Personal Drive (C:\WOLF\2013) and Fairbanks File Server Home Drive (H:\WOLF\2013) and Section Drive (S:\WOLF\2013). Hard copies will be filed in Room 120 file cabinet under Wolf/2013/20A/SUPE.

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Ecc:
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Scott Brainerd
Earl Becker

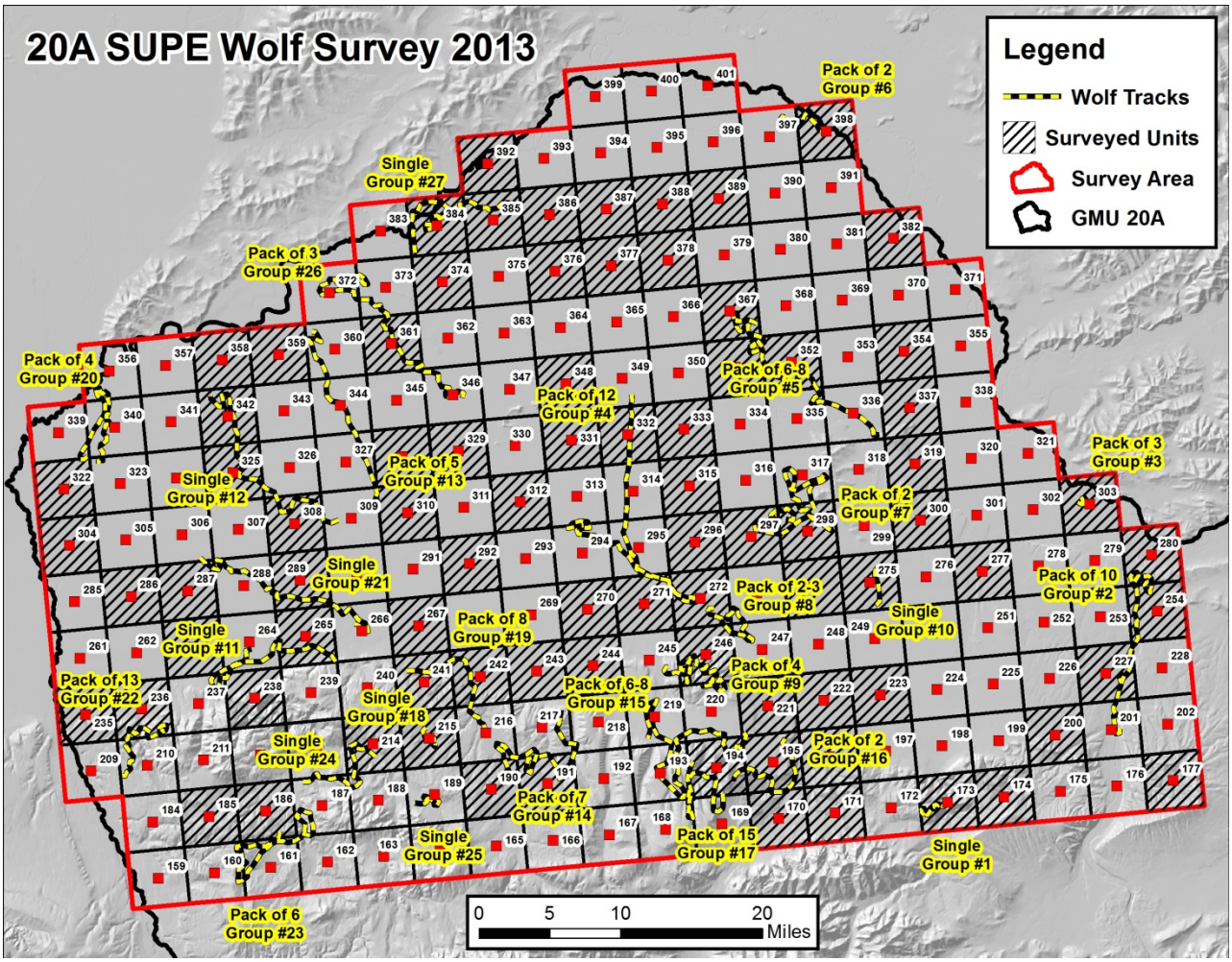

Figure 1. Estimated pack size and tracks of wolf packs observed during SUPE, Unit 20A, 2013.

Table 1. Wolf movement data and inclusion probabilities in a 3,440 mi^2 (8909 km^2) northcentral and northwest portions of Unit 20A in Interior Alaska during 25-27 February and 1 March 2013.

	ID	GroupSize	m_high	Pi	ty	Var
1	1	1	1	0.3860	2.590	2.63947
2	2	10	4	0.8604	11.622	16.21342
3	3	3	1	0.3860	7.771	32.93752
4	4	12	8	0.9814	12.227	2.20277
5	5	7	5	0.9153	7.648	3.66972
6	6	2	2	0.6242	3.204	2.46850
7	7	2	3	0.7706	2.595	0.69864
8	8	2	3	0.7706	2.595	1.53303
9	9	4	3	0.7706	5.191	5.92437
10	10	1	1	0.3860	2.590	2.63947
11	11	1	4	0.8604	1.162	-0.09073
12	12	1	5	0.9153	1.093	-0.02718
13	13	5	4	0.8604	5.811	3.41047
14	14	7	5	0.9153	7.648	5.03575
15	15	7	5	0.9153	7.648	8.50152
16	16	2	3	0.7706	2.595	2.92985
17	17	15	4	0.8604	17.433	43.20679
18	18	1	1	0.3860	2.590	2.63947
19	19	8	3	0.7706	10.381	22.89320
20	20	4	5	0.9153	4.370	0.87512
21	21	1	5	0.9153	1.093	-0.08669
22	22	13	2	0.6242	20.828	155.57964
23	23	6	5	0.9153	6.555	2.60595
24	24	1	4	0.8604	1.162	-0.01932
25	25	1	1	0.3860	2.590	2.63947
26	26	3	5	0.9153	3.278	0.35087
27	27	1	2	0.6242	1.602	0.25849

Pi denotes the inclusion probability, eq. 3 in Becker et al. 1998.
ty denotes the i_th observation's contribution to the population estimate (ty = GroupSize_i/Pi).
Var denotes the i_th observation's contribution to the variance of the population estimate.

Appendix A

WOLF SUPE FORM

Date _____ GMU _____ Aircraft Hours _____

Pilot _____ Observers _____

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

SAMPLING ORDER	1	2	3	4	5	6	7	8	9	10
SU ID										
SNOW AGE										
SNOW COVER										
LIGHT TYPE										
LIGHT DENSITY										
HABITAT TYPE										
SURVEY RATINGS										
START TIME										
COMMENTS										

PACK INFORMATION

Ref. #	SU Track 1st spotted	Time 1st spotted	SUs with tracks	SUs w/ wolves	Time tracking ended	Pack Size	Wolf Colors	In/Out	Comments (lat/longs) Start/wolves/end
1									
2									
3									

NOTES

Appendix B

```
R version 2.14.1 (2011-12-22)
Copyright (C) 2011 The R Foundation for Statistical Computing
ISBN 3-900051-07-0
Platform: x86_64-pc-mingw32/x64 (64-bit)

R is free software and comes with ABSOLUTELY NO WARRANTY.
You are welcome to redistribute it under certain conditions.
Type 'license()' or 'licence()' for distribution details.

  Natural language support but running in an English locale

R is a collaborative project with many contributors.
Type 'contributors()' for more information and
'citation()' on how to cite R or R packages in publications.

Type 'demo()' for some demos, 'help()' for on-line help, or
'help.start()' for an HTML browser interface to help.
Type 'q()' to quit R.

> setwd("C:/DATA/R_miscl/SUPE/Wolf2013GMU20A")
> source("C:\\DATA\\R_miscl\\SUPE\\SUPEcalc.r")
> Wolf2013TrackData <- read.delim("Wolf2013GMU20A_moveData.txt", header = TRUE, fill = TRUE)
> SUWolfData <- read.delim("Wolf2013GMU20A_SUdata.txt", header = TRUE, fill = TRUE)
> overlap <- read.delim("Wolf2013GMU20A_overlap.txt", header = TRUE, fill = TRUE)
> WolfPopEst2013GMU20A <- SUPEcalc(TrackData=Wolf2013TrackData,SUdata = SUWolfData,overlap=overlap,Species=c("Wolves"),AreaKM=8909,
+ PercentSingle=c("Yes"))

IMPORTANT - Function(SUPEcalc) - assumes strata ORDER is the SAME between TrackData, SUdata, and overlap


=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=

   TABLE 1 - Sample Unit Distribution and Effort
```

	SAMPLING Strata	Mh	nh	SamplFrac
1	High	215	83	0.386

TABLE 2 - Animal Movement Data and Inclusion Probabilities

	ID	GroupSize	m_high	Pi	ty	Var
1	1	1	1	0.3860	2.590	2.63947
2	2	10	4	0.8604	11.622	16.21342
3	3	3	1	0.3860	7.771	32.93752
4	4	12	8	0.9814	12.227	2.20277
5	5	7	5	0.9153	7.648	3.66972
6	6	2	2	0.6242	3.204	2.46850
7	7	2	3	0.7706	2.595	0.69864
8	8	2	3	0.7706	2.595	1.53303
9	9	4	3	0.7706	5.191	5.92437
10	10	1	1	0.3860	2.590	2.63947
11	11	1	4	0.8604	1.162	-0.09073
12	12	1	5	0.9153	1.093	-0.02718
13	13	5	4	0.8604	5.811	3.41047
14	14	7	5	0.9153	7.648	5.03575
15	15	7	5	0.9153	7.648	8.50152
16	16	2	3	0.7706	2.595	2.92985
17	17	15	4	0.8604	17.433	43.20679
18	18	1	1	0.3860	2.590	2.63947
19	19	8	3	0.7706	10.381	22.89320
20	20	4	5	0.9153	4.370	0.87512
21	21	1	5	0.9153	1.093	-0.08669
22	22	13	2	0.6242	20.828	155.57964
23	23	6	5	0.9153	6.555	2.60595
24	24	1	4	0.8604	1.162	-0.01932
25	25	1	1	0.3860	2.590	2.63947
26	26	3	5	0.9153	3.278	0.35087
27	27	1	2	0.6242	1.602	0.25849

Pi denotes the inclusion probability, eq. 3 in Becker et al. 1998.
ty denotes the i_th observation's contribution to the population estimate (ty = GroupSize_i/Pi).
Var denotes the i_th observation's contribution to the variance of the population estimate.

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Popln. Est. = 155.8724 Wolves Se = 17.93404 Var. = 321.6296 CV = 11.50559 %

90% C.I. = (125.2838 , 186.461)
t-value used = 1.705618 df= 26
95% C.I. = (119.0085 , 192.7363)
t-value used = 2.055529 df= 26
KNOWN LOWER LIMIT = 121 OBSERVED Wolves

Density = 17.49606 Wolves per 1000 km^2

90% C.I. = (14.06261 , 20.92951)
t-value used = 1.705618 df= 26
95% C.I. = (13.35823 , 21.63389)
t-value used = 2.055529 df= 26
KNOWN LOWER LIMIT = 13.58177 OBSERVED Wolves per 1000 km^2

Estimated Percentage of Single Wolves in the population = 10.56827 %
Estimated Percentage of Wolves in Groups = 89.43173 %

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REFERENCES

BECKER E. F., H. N. GOLDEN AND G. L. GARDNER. 2004. Using probability sampling of animal tracks in snow to estimate population size. Pages 248-270 (Chapter 13) in W. L. Thompson (ed.) Sampling rare or elusive species: concepts and techniques for estimating population parameters. Island Press. Washington D. C., USA.

BECKER, E. F., M. A. SPINDLER, AND T. O. OSBORNE. 1998. A population estimator based on network sampling of tracks in the snow. Journal of Wildlife Management 62(3):968-977.

Appendix C

	Start	Stop	Diff	Elapsed Minutes	Units Sampled	Partial Unts (from following tracks)
Jimmy Feb 26	10:00	13:47	3:47	227.00	6	3
Jimmy March 1	14:03	15:37	1:34	94.00	2	0
Jimmy Feb 25	10:04	16:37	6:33	393.00	11	6
Marty Feb 26	9:56	14:35	4:39	279.00	12	3
Marty Feb 25	10:31	17:10	6:39	399.00	13	6
Paul Feb 25	10:05	17:13	7:08	428.00	16	9
Paul Feb 26	10:21	17:20	6:59	419.00	13	6
Paul Feb 27	10:29	15:40	5:11	311.00	10	10
			Total	2550.00	83	43
				min/mi2	sq miles units sampled	
				1.92	1328	
				min/mi2 GIS	GIS area (buffer 1 mile)	
				1.07	**2378**	
				final GIS intensity based on 2022 sq miles and 2550 survey minutes		
				1.26	min/sq mile	
					846	area of partial SU tracks
					152	minus area of buffer inside surveyed units already accounted for
					694	extra track area
					2022	extra track area plus area of surveyed units

Appendix C. Unit 20A wolf sample unit probability estimator memorandum, Interior Alaska, 2015.

MEMORANDUM

State of Alaska
Department of Fish and Game
Division of Wildlife Conservation

TO:	Doreen Parker McNeill Management Coordinator RIII	DATE:	July 31, 2015
THRU:		TELEPHONE:	459-7233
FROM:	Don Young Fairbanks Area Wildlife Biologist Division of Wildlife Conservation Fairbanks	SUBJECT:	Wolf SUPE, Unit 20A, 2015

BACKGROUND

We conducted a wolf population estimate in Unit 20A to addresses the management objective to manage for a fall density ≥11 wolves/1,000 mi^2. In addition, moose and caribou populations in Unit 20A have been identified by the Board of Game as Intensive Management populations, thus monitoring the status and trend of the wolf population provides valuable information regarding the management of those populations.

METHODS

During 10-14 March 2015, we completed a wolf population estimate over 6416 mi^2 (16,617 km^2) of wolf habitat in Unit 20A (Fig.1) using the Survey Unit Probability Estimator (SUPE) technique (Becker et al. 2004). Survey timing coincided to the time of year when packs approach their lowest numbers (Burch et al. 2005). Our objective was to determine the number of wolves and packs to aid future management decisions. We followed the sampling assumptions described in Becker et al. (1998, 2004) and Patterson et al. (2004): 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. To meet these assumptions, we designed the survey to obtain an intensity of ≥ 0.8 minute/mi^2 (Becker et al. 1998). Survey time included all time spent within the survey area either on transects or tracking wolves.

We subdivided the survey area into 401 16mi^2 high-density sample units (SUs) and sampled 140 (sample fraction = 0.3491). Prior to the survey, we explained to each survey crew the required

sampling intensity. Observation data was recorded on a *Wolf SUPE Form* (Appendix A) and statistical computing was done in program *R version 3.1.2* (Appendix B).

Results and Discussion

We initiated the survey 2 days after a significant snowfall. Approximately 7"-8" fell 3-9 March with 4.3"of that falling on 7 March and an additional ½"-1" falling on 8-9 March (Fairbanks International Airport; Alaska Climate Research Center, http://akclimate.org/Climate/Fairbanks; Figs 2-4). *Snow Age* was mostly 1-4 days (range: *1-7+ days*) and *Snow Cover* was mostly *Complete* (range: *Bare Ground Showing* to *Complete*). *Survey Ratings*, in general, were good (range: *Poor* to *Excellent*). Operational cost to complete the survey was $21,478.

Survey intensity averaged 1.51 min/mi^2 (Appendix C). Sampling intensities varied due to habitat type and the presence of wolves.

We identified 106 individuals in 30 individual groups (mean = 3.53; range = 1–9; SE = 0.47); 6 observations were of single wolves, 10 of wolf pairs, and 14 of packs ≥3 wolves (Fig. 5; Table 1). The population estimate was 143 wolves (SE = 14.2; 90% CI = 119–167 wolves). The estimated percentage of wolves in groups was 92% and single wolves 8%. Following the pack inclusion rule outlined in Becker et al. (1998), the estimated density was 22.3 wolves/1000 m^2 (90% CI = 18.6–26.1 wolves/1000 m^2).

The 2015 wolf density estimate (22 wolves/1000 m^2) was substantially lower than the 2013 estimate (45 wolves/1000 m^2). We speculate this was due, at least in part, to sampling bias incorporated into the 2013 estimate due to sampling only a portion of the unit (3,440 m^2 of the northern portion that had favorable survey conditions) and arbitrarily assigning a hard boundary on the south side of the study area along the foothills. Wolf densities tend to be highest in the foothills of Unit 20A due to higher ungulate densities there as well. Specifically, we suspect that by sampling only a portion of Unit 20A in 2013 that wolf packs that straddled the southern boundary of the study area were included in the population estimate but the entire area (territories) occupied by those packs was not included in the total area surveyed, thus artificially inflating the wolf density estimate.

It is also likely that a portion of the observed decline is real. Denali National Park biologist have documented a decline in that population to historic low levels (~7 wolves/1000 m^2 during spring surveys 2015) and attribute that decline primarily to low snow accumulations recently. Low snow pack is an advantage to prey, but a disadvantage to wolves and typically leads to higher mortality/dispersal, lower fecundity/survival and, ultimately, lower wolf densities. In Unit 20A, the wolf density estimate declined from 45 wolves/1000 m^2 in 2013 to 22 wolves/1000 m^2 in 2015. Commensurate with that decline, mean group size declined from 4.48 to 3.53 and the largest pack went from 15 wolves to 9 wolves during that same time period.

RECOMMENDATIONS

Conduct a unit-wide SUPE in Unit 20A during spring 2020.

DATA ARCHIVING

This memorandum and pertinent electronic files will be archived on the Fairbanks File Server, ddyoung Home Drive (H:\Archives\Wolf\2015. Hard copies of field forms, data sheets, maps, etc. will be filed in Room 120 file cabinet under Wolf/2015/20A/SUPE.

LITERATURE CITED

Becker, E. F., M. A. Spindler, and T. O. Osborne. 1998. A Population Estimator Based on Network Sampling of Tracks in the Snow. The Journal of Wildlife Management 62:968-977.

Becker, E. F., H. N. Golden, and C. L. Gardner. 2004. Using probability sampling of animal tracks in snow to estimate population size. pp. 248-270. In Sampling rare or elusive species: Concepts, designs, and techniques for estimating population parameters, Edited by William Thompson, Island Press.

Burch, J. W., L. G. Adams, E. H. Follmann, and E. A. Rexstad. 2005. Evaluation of wolf density estimation from radiotelemetry data. Wildlife Society Bulletin 33:1225-1236.

Patterson, B. R., N. W. S. Quinn, E. F. Becker, and D. B. Meier. 2004. Estimating wolf densities in forested areas using network sampling of tracks in snow. Wildlife Society Bulletin 32:938-947.

Ecc:
T. Hollis
N. Pamperin
S. Brainerd
R. Delong
E. Becker
T. Paragi
D. Caudill

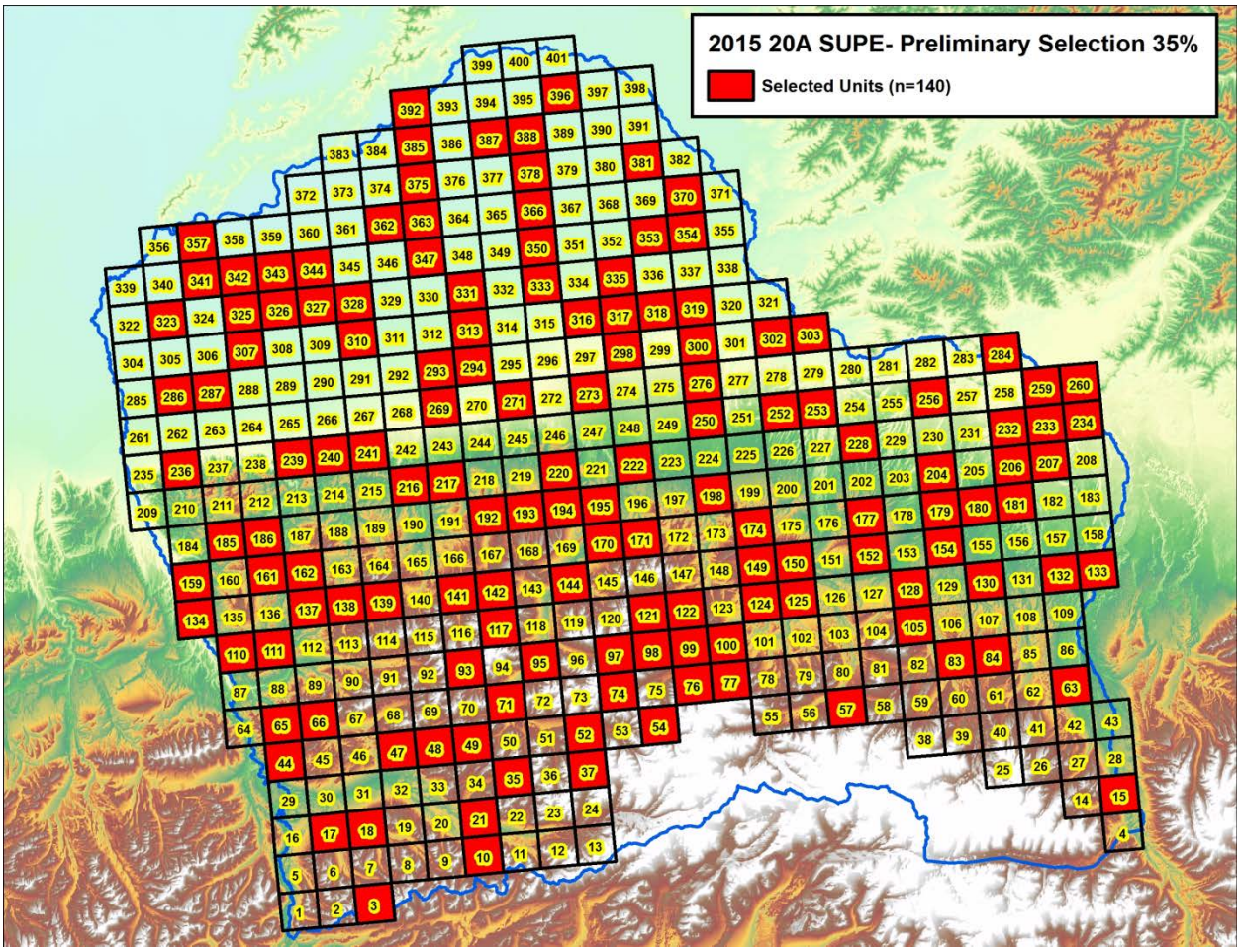

Figure 1. Survey Unit Probability Estimator selected survey units, Unit 20A, 2015.

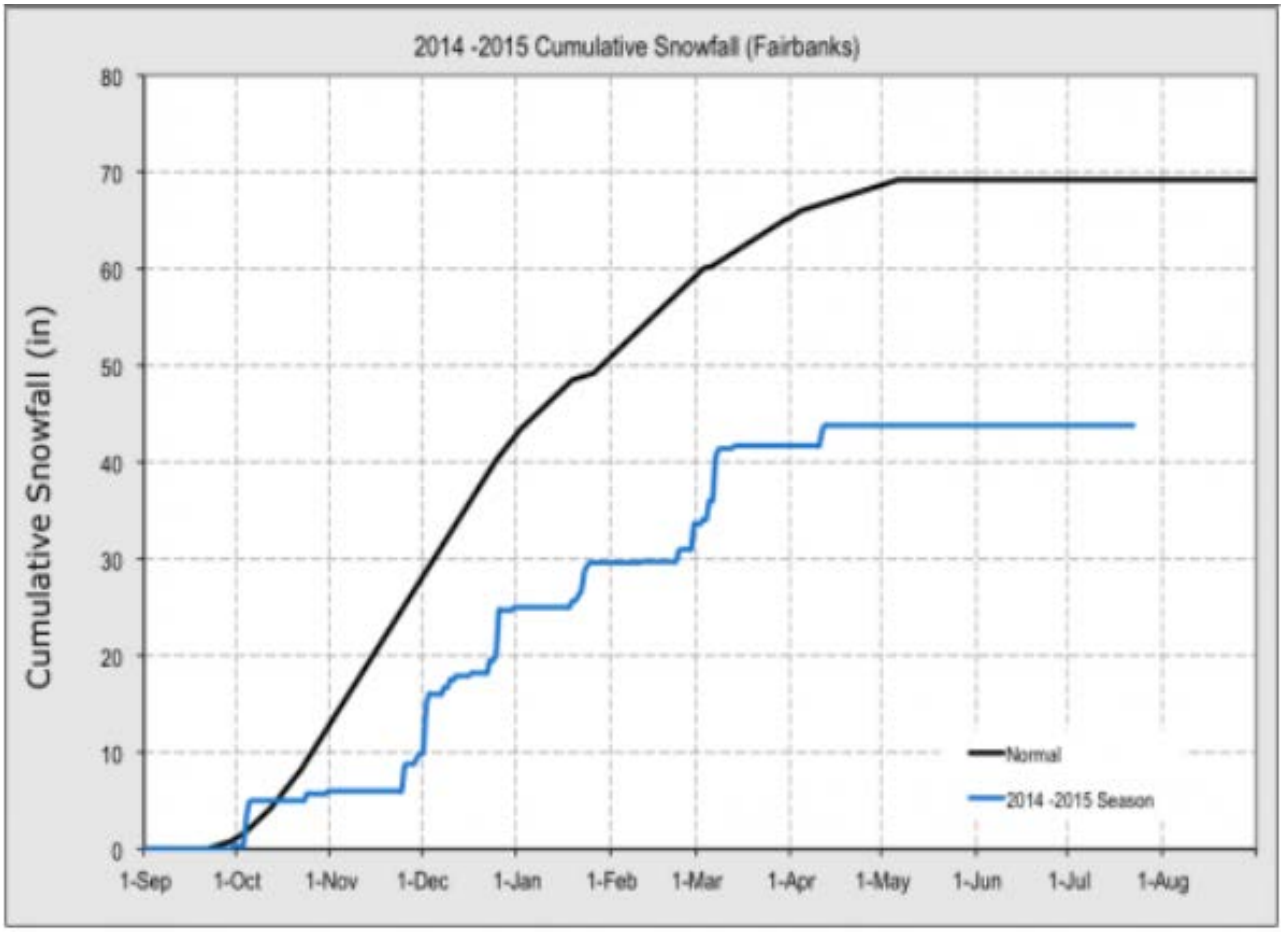

Figure 2. Cumulative snowfall, winter 2014-2015, Fairbanks, Alaska.

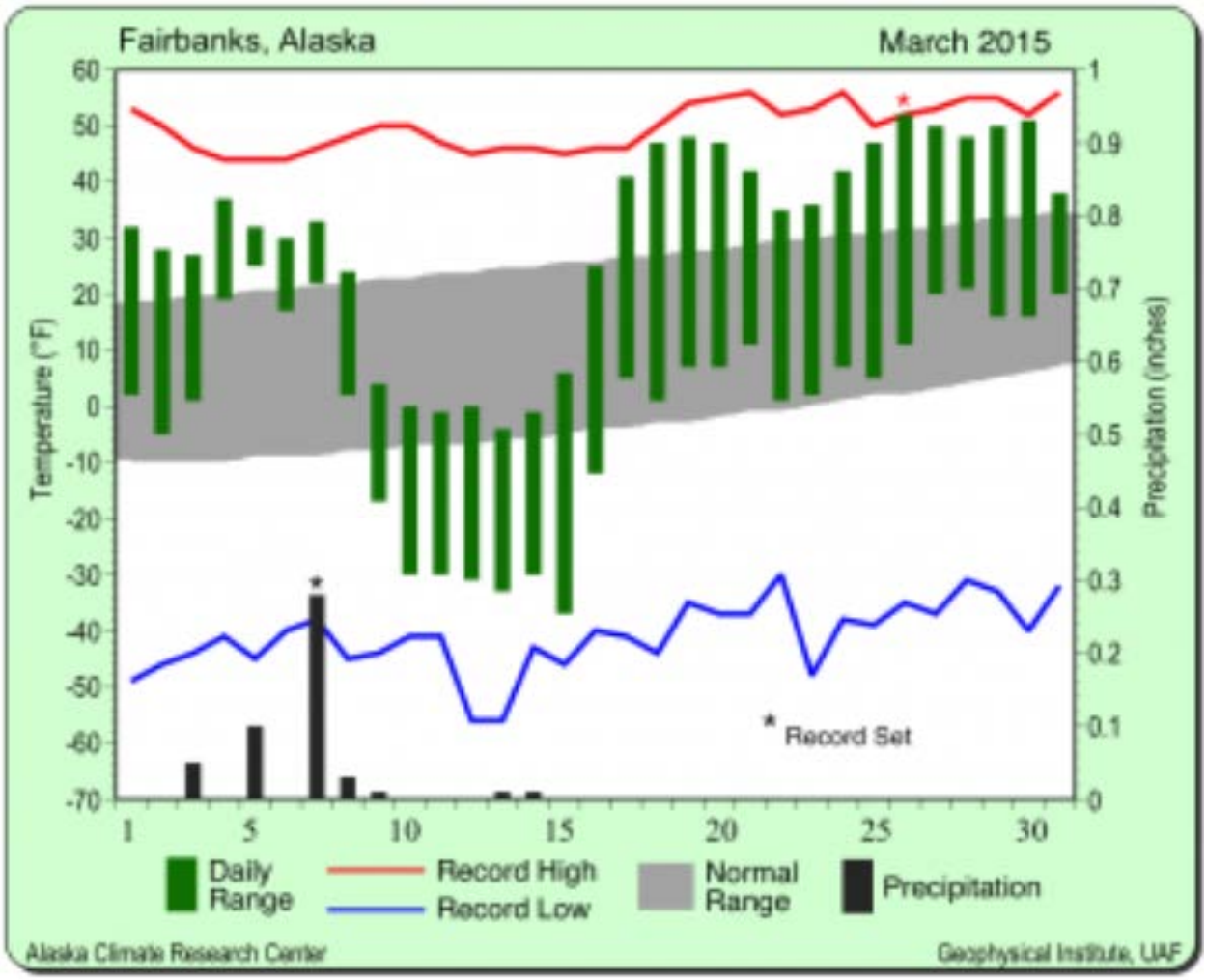

Figure 3. Precipitation by day, March 2015, Fairbanks, Alaska.

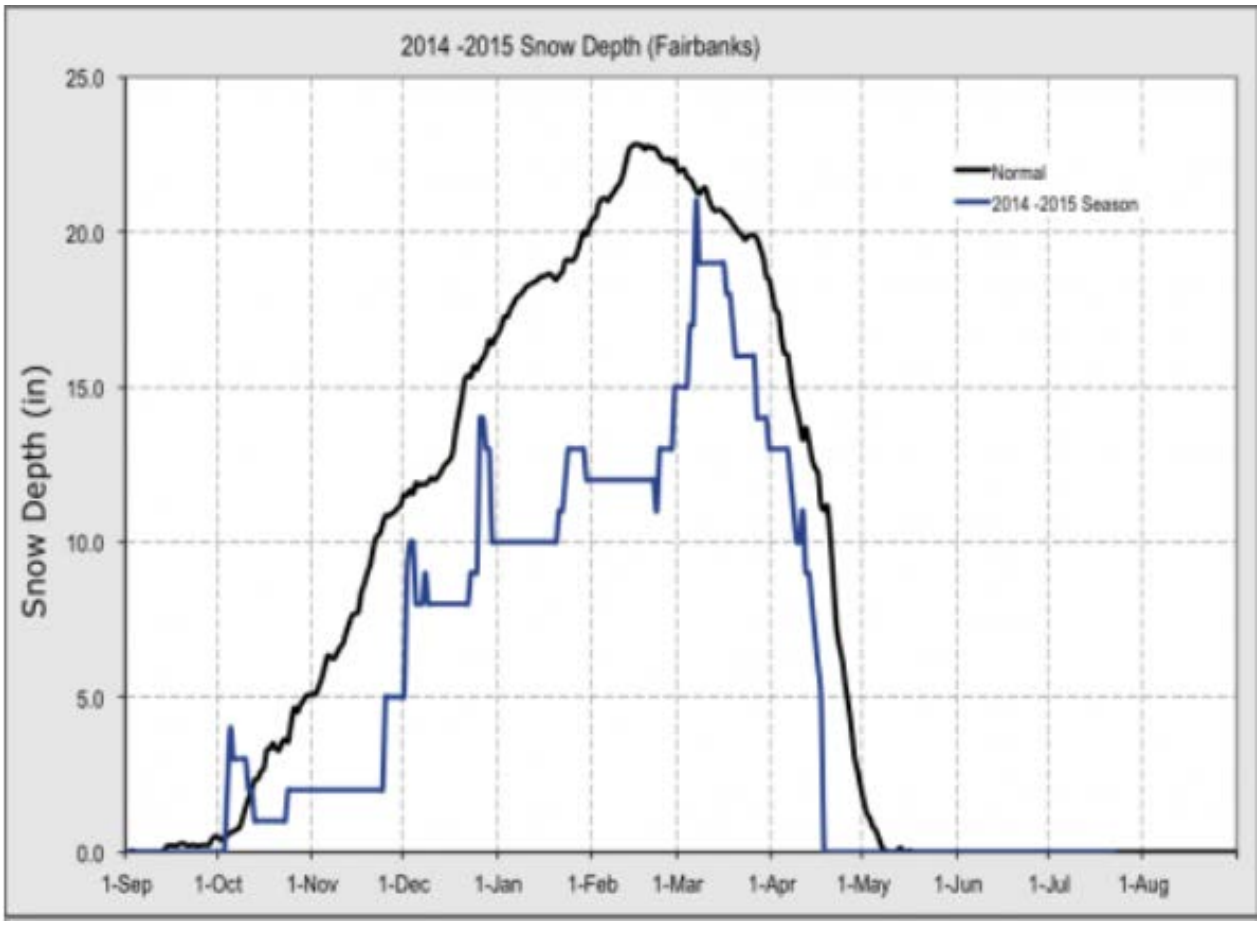

Figure 4. Snow depth, winter 2014-2015, Fairbanks, Alaska.

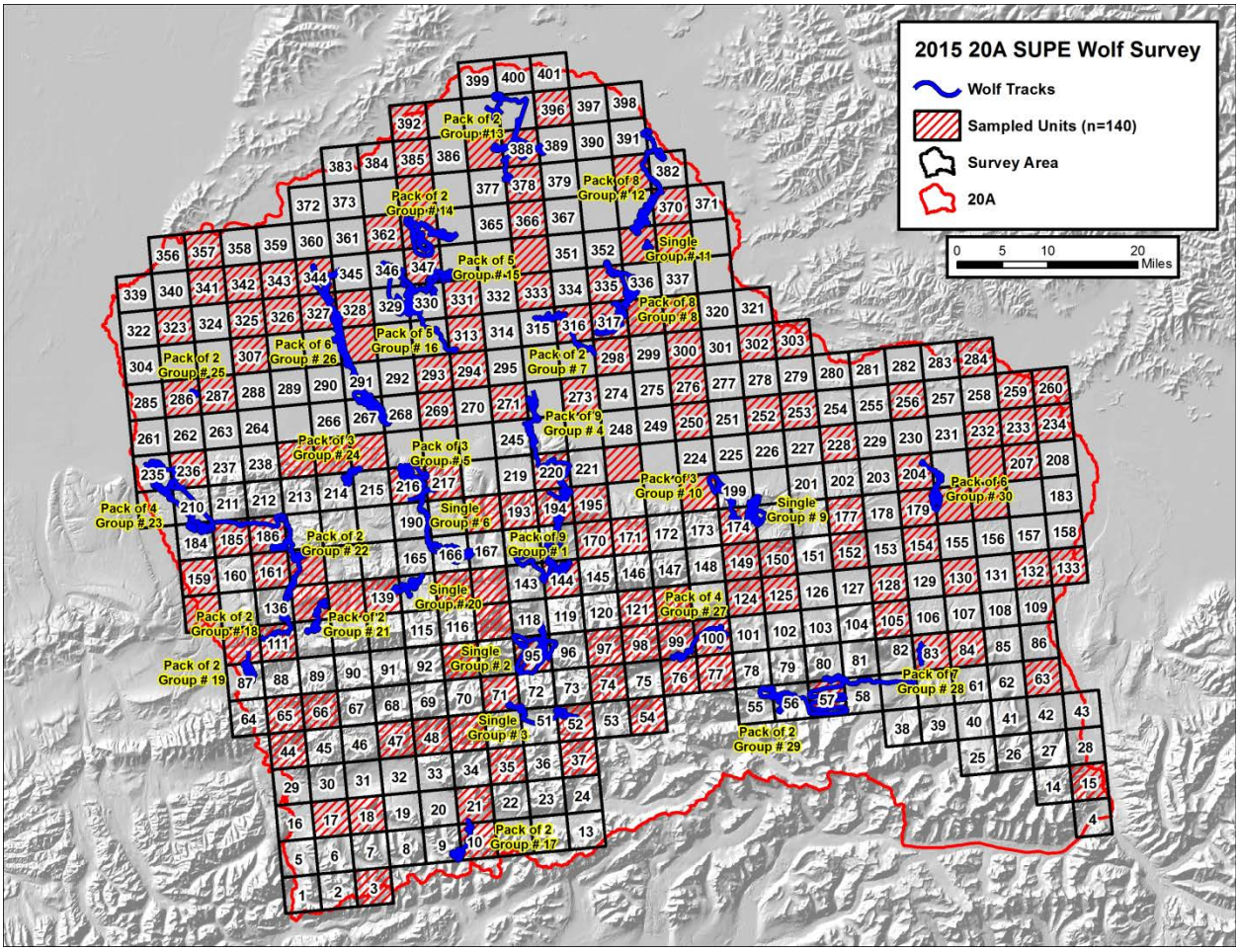

Figure 5. Estimated pack size and tracks of wolf packs observed during Survey Unit Population Estimator, Unit 20A, 2015.

Table 1. Wolf movement data and inclusion probabilities in a 6416 mi^2 (16,617 km^2) northcentral and northwest portions of Unit 20A in Interior Alaska during 10-14 March 2015.

	ID	GroupSize	m_high	Pi	ty	Var
1	1	9	5	0.8848	10.172	12.3442
2	2	1	1	0.3491	2.864	4.3261
3	3	1	3	0.7254	1.379	0.2164
4	4	9	4	0.8220	10.949	21.2603
5	5	3	2	0.5769	5.200	10.6994
6	6	1	5	0.8848	1.130	0.6874
7	7	2	4	0.8220	2.433	0.6438
8	8	8	5	0.8848	9.042	8.3056
9	9	1	3	0.7254	1.379	1.1554
10	10	3	2	0.5769	5.200	10.9535
11	11	1	1	0.3491	2.864	7.3535
12	12	8	5	0.8848	9.042	11.3329
13	13	2	6	0.9255	2.161	0.1430
14	14	2	2	0.5769	3.467	4.1168
15	15	5	2	0.5769	8.667	30.9433
16	16	5	6	0.9255	5.402	3.1225
17	17	2	3	0.7254	2.757	1.4832
18	18	2	2	0.5769	3.467	4.1168
19	19	2	2	0.5769	3.467	4.1168
20	20	1	2	0.5769	1.733	0.7786
21	21	2	2	0.5769	3.467	4.7863
22	22	2	4	0.8220	2.433	1.4078
23	23	4	8	0.9690	4.128	0.4149
24	24	3	3	0.7254	4.136	3.8006
25	25	2	1	0.3491	5.729	19.4088
26	26	6	5	0.8848	6.782	4.4537
27	27	4	3	0.7254	5.514	7.1684
28	28	7	8	0.9690	7.224	1.8817
29	29	2	3	0.7254	2.757	2.1087
30	30	6	3	0.7254	8.272	17.0555

Pi denotes the inclusion probability, eq. 3 in Becker et al. 1998.
ty denotes the i_th observation's contribution to the population estimate (ty = GroupSize_i/Pi).
Var denotes the i_th observation's contribution to the variance of the population estimate.

Appendix A

WOLF SUPE FORM

Date _____ GMU _____ Aircraft Hours _____

Pilot _____ Observers _____

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

SAMPLING ORDER	1	2	3	4	5	6	7	8	9	10
SU ID										
SNOW AGE										
SNOW COVER										
LIGHT TYPE										
LIGHT DENSITY										
HABITAT TYPE										
SURVEY RATINGS										
START TIME										
COMMENTS										

PACK INFORMATION

Ref. #	SU Track 1st spotted	Time 1st spotted	SUs with tracks	SUs w/ wolves	Time tracking ended	Pack Size	Wolf Colors	In/Out	Comments (lat/longs) Start/wolves/end
1									
2									
3									

NOTES

Appendix B

```
R version 3.1.2 (2014-10-31) -- "Pumpkin Helmet"
Copyright (C) 2014 The R Foundation for Statistical Computing
Platform: x86_64-w64-mingw32/x64 (64-bit)

R is free software and comes with ABSOLUTELY NO WARRANTY.
You are welcome to redistribute it under certain conditions.
Type 'license()' or 'licence()' for distribution details.

R is a collaborative project with many contributors.
Type 'contributors()' for more information and
'citation()' on how to cite R or R packages in publications.

Type 'demo()' for some demos, 'help()' for on-line help, or
'help.start()' for an HTML browser interface to help.
Type 'q()' to quit R.

> setwd("C:/DATA/R_miscl/SUPE/Wolf2015GMU20A")
> source("C:\\DATA\\R_miscl\\SUPE\\SUPEcalc.r")
> Wolf2015TrackData <- read.delim("Wolf2015GMU20A_moveData.txt", header = TRUE, fill
    = TRUE)
> SUWolfData <- read.delim("Wolf2015GMU20A_SUdata.txt", header = TRUE, fill = TRUE)
> overlap <- read.delim("Wolf2015GMU20A_overlap.txt", header = TRUE, fill = TRUE)
> WolfPopEst2015GMU20A <- SUPEcalc(TrackData=Wolf2015TrackData,SUdata =
    SUWolfData,overlap=overlap,Species=c("Wolves"),AreaKM=16617,
+                   + PercentSingle=c("Yes"))
Error: unexpected '=' in:
"WolfPopEst2015GMU20A <- SUPEcalc(TrackData=Wolf2015TrackData,SUdata =
    SUWolfData,overlap=overlap,Species=c("Wolves"),AreaKM=16617,
                  + PercentSingle="
> WolfPopEst2015GMU20A <- SUPEcalc(TrackData=Wolf2015TrackData,SUdata =
    SUWolfData,overlap=overlap,Species=c("Wolves"),AreaKM=16617,PercentSingle=c("
    Yes"))

IMPORTANT - Function(SUPEcalc) - assumes strata ORDER is the SAME between TrackData,
    SUdata, and overlap


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    =

  TABLE 1 - Sample Unit Distribution and Effort
________________________________________________________________
       SAMPLING
     Strata      Mh      nh      SamplFrac
```

1	High	401	140	0.3491

TABLE 2 - Animal Movement Data and Inclusion Probabilities

	ID	GroupSize	m_high	Pi	ty	Var
1	1	9	5	0.8848	10.172	12.3442
2	2	1	1	0.3491	2.864	4.3261
3	3	1	3	0.7254	1.379	0.2164
4	4	9	4	0.8220	10.949	21.2603
5	5	3	2	0.5769	5.200	10.6994
6	6	1	5	0.8848	1.130	0.6874
7	7	2	4	0.8220	2.433	0.6438
8	8	8	5	0.8848	9.042	8.3056
9	9	1	3	0.7254	1.379	1.1554
10	10	3	2	0.5769	5.200	10.9535
11	11	1	1	0.3491	2.864	7.3535
12	12	8	5	0.8848	9.042	11.3329
13	13	2	6	0.9255	2.161	0.1430
14	14	2	2	0.5769	3.467	4.1168
15	15	5	2	0.5769	8.667	30.9433
16	16	5	6	0.9255	5.402	3.1225
17	17	2	3	0.7254	2.757	1.4832
18	18	2	2	0.5769	3.467	4.1168
19	19	2	2	0.5769	3.467	4.1168
20	20	1	2	0.5769	1.733	0.7786
21	21	2	2	0.5769	3.467	4.7863
22	22	2	4	0.8220	2.433	1.4078
23	23	4	8	0.9690	4.128	0.4149
24	24	3	3	0.7254	4.136	3.8006
25	25	2	1	0.3491	5.729	19.4088
26	26	6	5	0.8848	6.782	4.4537
27	27	4	3	0.7254	5.514	7.1684
28	28	7	8	0.9690	7.224	1.8817
29	29	2	3	0.7254	2.757	2.1087
30	30	6	3	0.7254	8.272	17.0555

Pi denotes the inclusion probability, eq. 3 in Becker et al. 1998.
ty denotes the i_th observation's contribution to the population estimate (ty = GroupSize_i/Pi).
Var denotes the i_th observation's contribution to the variance of the population estimate.

=-

Popln. Est. = 143.2156 Wolves Se = 14.16283 Var. = 200.5858 CV = 9.889169 %

90% C.I. = (119.1511 , 167.28)
t-value used = 1.699127 df= 29
95% C.I. = (114.2493 , 172.1818)
t-value used = 2.04523 df= 29

KNOWN LOWER LIMIT = 106 OBSERVED Wolves
Density = 8.618619 Wolves per 1000 km^2

90% C.I. = (7.170436 , 10.0668)
t-value used = 1.699127 df= 29
95% C.I. = (6.87545 , 10.36179)
t-value used = 2.04523 df= 29

KNOWN LOWER LIMIT = 6.379009 OBSERVED Wolves per 1000 km^2

Estimated Percentage of Single Wolves in the population = 7.924637 %
Estimated Percentage of Wolves in Groups = 92.07536 %
=-

REFERENCES

BECKER E. F., H. N. GOLDEN AND G. L. GARDNER. 2004. Using probability sampling of animal
tracks in snow to estimate population size. Pages 248-270 (Chapter 13) in
W. L. Thompson (ed.) Sampling rare or elusive species: concepts and techniques for
estimating population parameters. Island Press. Washington D. C., USA.

BECKER, E. F., M. A. SPINDLER, AND T. O. OSBORNE. 1998. A population estimator based on network sampling of tracks in the snow. Journal of Wildlife Management 62(3):968-977.

Appendix C

	4415.00	Total Minutes
	2240.00	Total Survey Area by Units (16*140)
Intensity without partial units	1.97	min/sq mi (not including areas of partial units)
	675.00	Area of partial units from GIS (sq miles)
	2915.00	Total Area
Intensity with partial units	1.51	min/sq mi


ALASKA
DEPARTMENT OF FISH AND GAME