Annual Report to the Alaska Board of Game on Intensive Management for Moose with Wolf Predation Control in Unit 13

Prepared by the Division of Wildlife Conservation
February 2023

1) Description of IM Program[1] and Department recommendation for reporting period.

A) This report is an annual **evaluation for a predation control program authorized by the Alaska Board of Game (Board) under 5 AAC 92.121**

B) Month this report was submitted by the Department to the Board:

February (annual report) **Year** 2023

C) Program name: Unit 13 Wolf Predation Control Area

D) Existing program has **an associated Operational Plan** and does have a detailed Intensive Management Plan in regulation (5 AAC 92.121).

E) Game Management Unit(s) fully or partly included in IM program area:
Units 13A, 13B, 13C, 13D, and 13E.

F) IM objectives for moose:

- Population objective for Unit 13 is 17,000–21,400 moose.
- Harvest objective for Unit 13 is 1,050–2,180 moose.

Table 1. Population and harvest objectives for moose in the Unit 13 wolf predation control area.

Population	Population Objective	Harvest Objective
Unit 13A	3,500–4,200	210–420
Unit 13B	5,300–6,300	310–620
Unit 13C	2,000–3,000	155–350
Unit 13D	1,200–1,900	75–190
Unit 13E	5,000–6,000	300–600

G) Month and year the current predation control program was originally authorized by the Board: March 2000 **Indicate date(s) if renewed:**

- March 2005 - IM area increased to include Unit 13C.
- October 2010 - Plan renewed through 2016.
- February 2016 - Plan renewed through 2027
- January 2022 – Wolf objectives modified and IM area increased to include Unit13D effective RY22.

[1] For purpose and context of this report format, see *Agency Protocol for Intensive Management of Big Game in Alaska*.

H) Predation control is active **in this IM area.**

The suspension of predation control for regulatory year (RY) 2017 (RY17 = 1 July 2017 through 30 June 2018) was in response to an undetermined spring wolf estimate in RY13, a RY14 spring wolf estimate below the minimum intensive management objective, a RY15 spring wolf estimate below the minimum intensive management objective, and an undetermined spring wolf estimate in RY16. The activation of predation control for RY 18 was in response to a spring RY17 wolf estimate above the maximum intensive management objective. Predation control was activated for RY19 only in subunit 13B, as spring wolf estimates were borderline within the intensive management objective, and moose abundance was above moose population objectives for other subunits. Predation control was activated for RY20 only in subunits 13A and 13B, as fall wolf estimates necessitated additional wolf removal but moose abundance was above moose population objectives for other subunits. Predation control was suspended for RY21 in response to a fall wolf estimate that was likely to result in a spring wolf estimate within or near wolf objectives through typical hunting and trapping pressure, moose populations within or above objectives in most subunits, and insufficient response in moose abundance after 3 years of active predator control in 13B.

I) If active, month and year the current predation control program began:

March 2000. The program was suspended in RY12, RY15–17 because spring wolf population estimates were below the intensive management objective. The predator control plan was reauthorized for 10 years in February 2016. The program was activated again in RY18. Predation control was suspended in subunits 13A, 13C, and 13E for RY19. Predation control was suspended in subunits 13C and 13E for RY20. Predation control was suspended in all subunits for RY21.

J) A habitat management program funded by the Department or from other sources is currently active in this IM area: Yes

The Alphabet Hills Prescribed Burn will be implemented when prescription conditions are met.

K) Size of IM program area (square miles) and geographic description:

- 15,416 miles^2 (Figure 1).

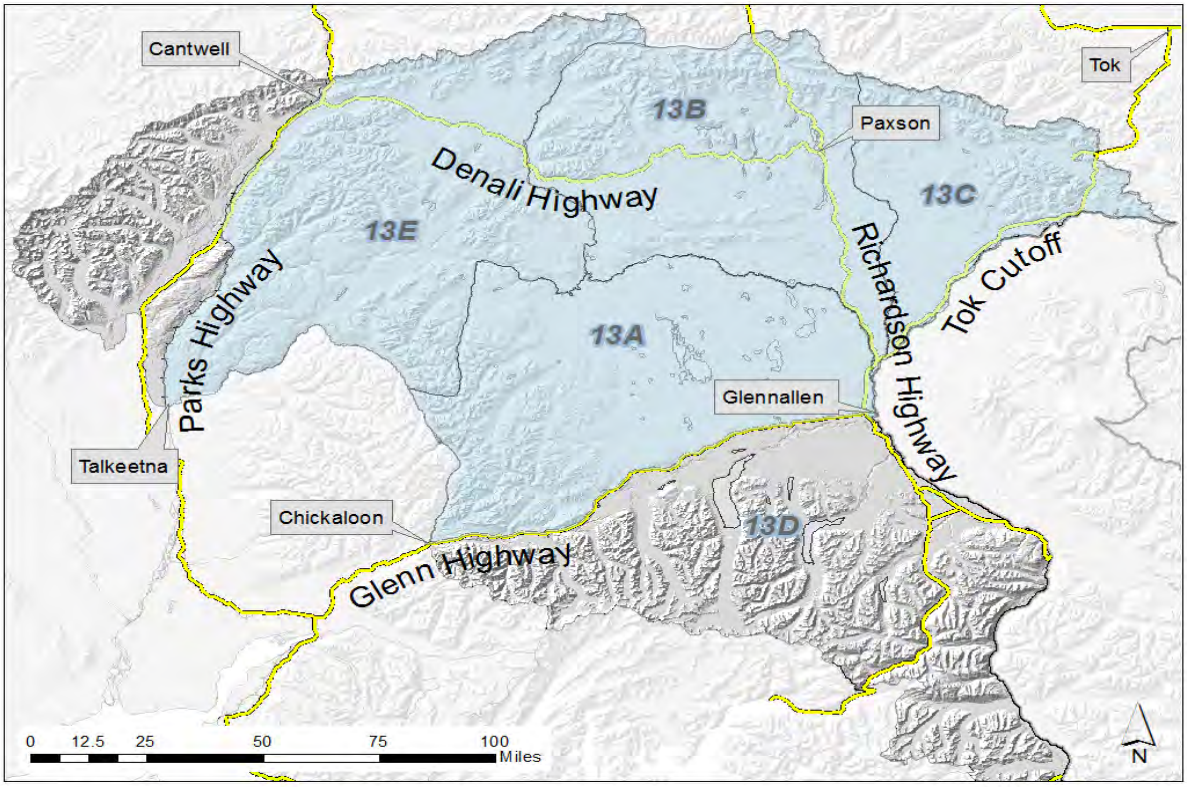

Figure 1. Area under intensive management for moose in Unit 13.

L) Size and geographic description of area for assessing ungulate abundance within the IM area:

Unit 13 – approximately 23,367 miles^2.

Seven continuous moose count areas (CA) 3, 5, 6, 10, 13, 14, and 16 across Unit 13 encompass a total of 3,219 miles^2 (Figure 2). Periodic surveys are also flown in CA 7, 12, 17, 21, 22, and 23, encompassing an additional 2,146 miles^2. Periodic surveys help to refine estimates of abundance. (CA 21, 22, and 23 are on the border of the IM area; CA15 is outside of the IM area.)

M) Size and geographic description of area for ungulate harvest reporting:

Unit 13 – approximately 23,367 miles^2.

N) Size and geographic description of area for assessing predator abundance:

Unit 13 – approximately 23,367 miles^2.

O) Size and geographic description of predation control area:

14,188 miles^2 were open to predation control in RY13; closures include populated areas and federal lands where same-day-airborne take of wildlife is not allowed.

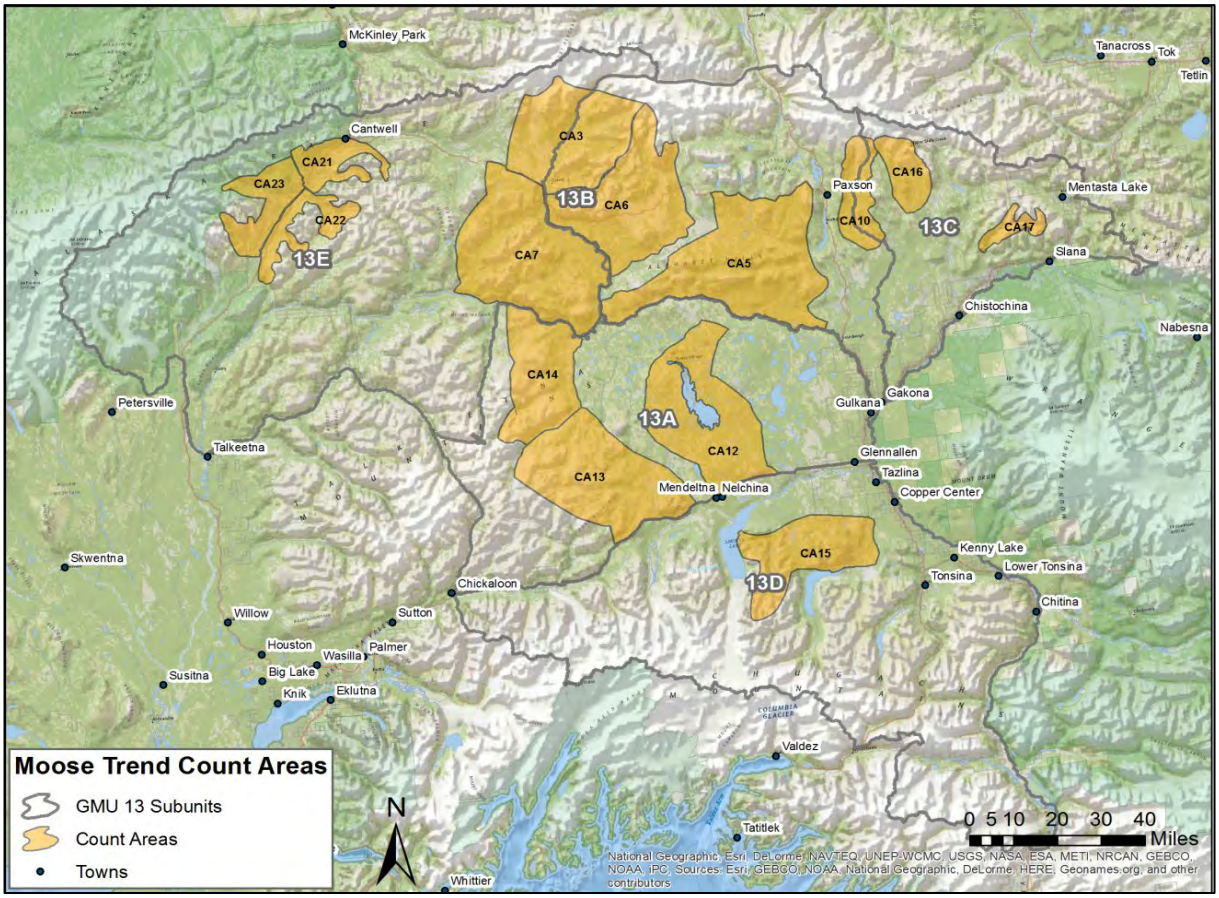

Figure 2. Location of moose trend count areas (CA) in Unit 13.

P) Criteria for evaluating progress toward IM objectives:

- Population abundance
- Moose harvest
- Calf-to-cow ratios
- Bull-to-cow ratios

Q) Criteria for success with this program:

- Achieve population and harvest objectives (F)
- Maintain a minimum of 25 bulls:100 cows for Unit 13
- Maintain a minimum of 30 calves:100 cows for Units 13B, 13C, and 13E, and a minimum of 25 calves:100 cows for Unit 13A.

R) Department recommendation for IM program in this reporting period:
The Department recommends continuation of the program. *See* Section 6 of this report.

S) IM Annual Report data and information inclusion date:

February X **(annual report)** **Year** 2022

2) Prey data

Date(s) and method of most recent fall **abundance assessment for moose in Unit 13 (if statistical variation available, describe method here and show result in Table 1):**
Fall trend count surveys are conducted annually October–December to determine sex and age composition of moose. The most recent surveys were conducted in October and November 2022 (RY22). Trend count data were extrapolated to estimate unit-wide population abundance indices.

Compared to IM area, was a similar trend and magnitude of difference in abundance observed in nearby non-treatment area(s) since program inception N **[*Y/N*] and in the last year** N **[*Y/N*]? Describe comparison if necessary:**
Moose abundance in CAs receiving control treatment has increased or stabilized whereas abundance in the adjacent non-treatment areas (CA 15 in Unit 13D) has suggested a decline over the past several years.

Table 2a. Moose abundance, age and sex composition in assessment area (L) since program implementation in Year 10 **(not exclusively limited to inception of predation control) to** Year 22. **Regulatory year is 1 July to 30 June (e.g, RY2012 is 1 July 2012 to 30 June 2013).**

			Composition (number per 100 cows)			Total
Period	RY	Estimated Abundance[a]	Calves	Yearling Males	Males	observed (*n*)
Year 8	2008	17,040	19	12	35	4,481
Year 9	2009	18,812	24	10	33	5,355
Year 10	2010	19,720	22	10	31	5,847
Year 11	2011	20,350	23	10	33	5,614
Year 12	2012	20,575	16	7	32	6,468
Year 13	2013	20,634	27	6	34	6,837
Year 14	2014	20,492	16	11	35	2,213
Year 15	2015	21,090	25	7	32	5,558
Year 16	2016	20,402	19	8	32	3,848
Year 17	2017	17,746	20	6	30	3,992
Year 18	2018	18,633	13	5	29	4,219
Year 19	2019	18,997	16	4	28	4,153
Year 20	2020	18,587	18	5	27	5,715
Year 21	2021	19,298	19	6	28	6,013
Year 22	2022	16,577	16	6	30	5,496

[a] Abundance estimates were reevaluated in 2015 to take advantage of modern mapping technology and provide a more accurate extrapolation based on annual survey data.

Describe trend in abundance or composition:
Moose across the Unit 13 treatment area generally increased after IM program inception, although current data indicates that moose abundance may have peaked in 2015. In recent years bull-to-cow ratios have been declining or have stabilized near the objectives for subunits within the IM area. Yearling bull-to-cow and calf-to-cow ratios are declining. Based on extrapolation of fall count area densities, moose population indices were calculated by subunit for 2010 at: 4,081 moose in Unit 13A, 5,460 moose in Unit 13B, 3,000 moose in Unit

13C, and 5,041 moose in Unit 13E. Moose population estimates by subunit in 2022 were: 3,621 moose in Unit 13A, 3,677moose in Unit 13B, 2,943 moose in Unit 13C, and 5,273 moose in Unit 13E.

Table 2b. Moose abundance, age and sex composition in comparison area, Unit 13(D), CA15.

			Composition (number per 100 cows)			Total
Period	RY	Estimated Abundance	Calves	Yearling Males	Males	Observed (*n*)
Year 8	2008	1,818	17	15	79	171
Year 9	2009	-	-	-	-	-
Year 10	2010	2,137	23	12	72	201
Year 11	2011	1,829	10	7	62	172
Year 12	2012	1,829	14	2	67	172
Year 13	2013	1,414	12	3	89	133
Year 14	2014	1,605	17	9	69	151
Year 15	2015	1,063	8	7	58	100
Year 16	2016	1,403	21	18	89	132
Year 17	2017	-	-	-	-	-
Year 18	2018	-	-	-	-	-
Year 19	2019	1,201	18	3	70	113
Year 20	2020	1,031	12	12	82	97
Year 21	2021	1,340	19	8	84	126
Year 22	2022	1,063	16	10	88	100

Table 3. **Moose harvest in assessment area (M). Methods for estimating unreported harvest are described in Survey and Inventory reports.**

		Reported		Estimated				
Period	RY	Male	Female	Unreported	Illegal	Total harvest[a]	Other mortality[b]	Total
Year 8	2008	735	1	25	25	790	75	865
Year 9	2009	861	2	25	25	916	75	991
Year 10	2010	945	1	25	25	996	75	1,071
Year 11	2011	951	1	25	25	1,002	100	1,102
Year 12	2012	712	5	25	30	775	75	850
Year 13	2013	721	2	25	30	778	75	853
Year 14	2014	928	4	25	30	992	75	1,067
Year 15	2015	1,050	8	25	30	1,113	75	1,188
Year 16	2016	1,077	7	25	30	1,144	75	1,219
Year 17	2017	978	8	25	30	1,061	75	1,136
Year 18	2018	789	7	25	30	856	75	931
Year 19	2019	896	11	25	30	969	165	1,134
Year 20	2020	858	18	25	30	935	75	1,010
Year 21	2021	808	27	25	30	890	75	965
Year 22[c]	2022[c]	647	18	25	30	720	75	795

[a] Includes unknown sex reported harvest.
[b] Vehicle/train mortality.
[c] Harvest for the latest RY has not been finalized.

Describe trend in harvest: Moose harvests increased in the treated area of Unit 13 through

2011, declined in 2012 and 2013, and returned to a higher level in 2014–2016. Total harvest dropped slightly in 2017 from levels observed in 2016, and harvest dropped again in 2018, but has since remained relatively stable. Harvest has been variable but has increased slightly in recent years in Unit 13(D) which is not part of the treatment area. Hunting pressure has increased in Unit 13 since 2009, due to regulatory changes providing additional harvest opportunities; the lower threshold of the Unit 13 harvest objective was reached in RY15, RY16, and RY17. Harvest has since been below the objective range except for Units 13A and 13D which were within objectives in RY21. The winter of 2021–22 received record snowfall in parts of Unit 13 which contributed to a decline in moose abundance in subunits where abundance was at or above the maximum objective. The fall of 2022 was unusually rainy and windy. The decline in numbers and unfavorable weather both contributed to a decrease in harvest for RY22.

3) Predator data

Date(s) and method of most recent spring abundance assessment for wolves:
The most recent spring abundance estimate of 126 wolves in Unit 13 (RY21; spring of 2022) was derived from observations of wolves by ADF&G staff, hunters, trappers, and pilots minus the documented harvest. The severe winter and the migration of the Nelchina caribou herd out of Unit 13 for the winter both were likely contributors to the lower than expected wolf abundance observed in the spring of 2022.

Date(s) and method of most recent fall abundance assessment for wolves:
The most recent fall abundance assessment for Unit 13 of approximately 252 wolves (RY2022; fall of 2022) was derived by estimating pup production and survival for packs observed by ADF&G staff, hunters, trappers, and pilots.

Table 4. Wolf abundance objectives and removal in wolf assessment area (N). The annual removal objective in Unit 13 depends on the fall wolf abundance. The goal is to

reduce the overall number of wolves in the wolf assessment area (N) to meet the spring wolf objective, so estimated or confirmed number remaining in the wolf assessment area (N) by spring (30 April) each RY is 135–165.

Period	RY	Fall abundance in area N	Harvest removal from area N		Dept. control removal from area O	Public control removal from area O	Total removal[a] from area N (% from area O)	Spring abundance in area N
			Trap	Hunt				
Year 8	2008	273	38	26	0	55	121 (76)	144
Year 9	2009	272	42	18	0	23	83 (67)	180
Year 10	2010	314	46	10	0	103	159 (92)	146
Year 11	2011	204	16	35	0	40	91 (80)	104
Year 12	2012	266	37	21	0	0	59 (69)	191
Year 13	2013	320	26	16	0	60	102 (89)	-
Year 14	2014	-	35	18	0	0	53 (83)	84
Year 15	2015	-	40	16	0	0	56 (89)	-
Year 16	2016	-	76	16	0	0	92 (89)	-
Year 17	2017	-	52	37	0	0	89 (89)	250
Year 18	2018	400	66	31	0	118	235 (90)	168
Year 19	2019	260	46	28	0	8	82 (85)	155
Year 20	2020	320	75	29	0	59	163 (85)	150
Year 21	2021	275	11	24	0	0	35 (74)	126
Year 22	2022	252	TBD	TBD	0	TBD	TBD	TBD

[a] Additional removal may be Defense of Life and Property, vehicle kill, etc.

4) Habitat data and nutritional condition of prey species

Where active habitat enhancement is occurring or was recommended in the Operational Plan, describe progress toward objectives:

Objective(s): No objectives have been specified.

Area treated and method: No area was treated during this report period.

Observation on treatment response:
The only large-scale habitat improvement project that has occurred recently in Unit 13 is the 41,000 acre[2] Alphabet Hills Prescribed Burn in 2003 and 2004 on the border of Unit 13(A) and 13(B). Further burning under this plan is still being pursued, though it is contingent upon meeting burn prescriptions and having available suppression resources.

Table 5. Moose abundance, age and sex composition in habitat improvement area, Unit 13(A) Alphabet Hills Prescribed Burn count area (65 square miles).

			Composition (number per 100 cows)		
Period	RY	Moose observed	Calves	Yearling bulls	Males
Year 8	2008	116	14	21	51
Year 9	2009	209	29	6	62
Year 10	2010	186	24	24	88
Year 11	2011	109	24	8	94
Year 12	2012	136	13	5	107
Year 13	2013	122	26	7	71
Year 14	2014	-	-	-	-
Year 15	2015	135	18	10	97
Year 16	2016	-	-	-	-
Year 17	2017	241	14	11	84
Year 18	2018	166	10	4	65
Year 19	2019	245	10	3	57
Year 20	2020	122	7	4	119
Year 21	2021	149	6	5	80
Year 22	2022	105	10	10	58

Similar trend in nearby non-treatment areas?
The habitat improvement area is a small burn, and composition is based on a small count area (65 miles^2). Annual variability is high. The nearest adjacent count area is CA 5, which is substantially larger (846 miles^2) and contains more variable moose habitat. Because these areas are adjacent, moose in western CA 5 may be experiencing some benefit from the habitat improvement area. In 2019 the bull-to-cow ratio in CA 5 dropped to 29, which is the lowest observed since 2004, and remained relatively low through 2021 at 32, increasing to 38 in 2022. From 2007 through 2018 the bull-to-cow ratio in CA5 was fairly stable with an average of 41 bulls:100 cows. Bull ratios are higher in the treatment area. Ratios reached a high of 119 bulls:100 cows in 2020, up from 57 bulls:100 cows observed in the treatment area in 2019, which was the lowest observed since 2008. Bull ratios returned to 58 bulls:100 cows observed in the treatment area in 2022. The calf-to-cow ratio is typically higher in CA5 than in the treatment area. In 2022 the calf-to-cow ratio was 14 in CA5 and 10 in the treatment areas. There has been a declining trend in calf-to-cow ratios in both areas since 2013.

Describe any substantial change in habitat not caused by active program:
No major habitat changes have occurred in this area in recent years.

Table 6. **Nutritional indicators for moose in assessment area (L).**

Period	RY	Twinning Rate (radiocollared parturient cows[a])	Twinning rates (random parturient cows) Prior to 1 June
Year 8	2008	25% in 13A west (n=32)	28% in 13A west (n=79); 50% in 13E (n=unk)
Year 9	2009	38% in 13A west (n=24)	13% in 13A west (n=24)
Year 10	2010	33% in 13A west (n=18)	-
Year 11[b]	2011	33% in 13A west (n=12); 11% in 13B (n=9)	-
Year 12	2012	30% in 13A northwest & 13E south (n=44); 18% in 13A and 13B (n=17)	20% in 13A northwest & 13E south (n=40)
Year 13	2013	44% in 13A and 13B (n=18) 46% in northwest Unit 13 (n=34)	19% in 13A west (n=32); 42% in 13C (n=24)
Year 14	2014	20% in 13A and 13B (n=20) 46% in northwest Unit 13 (n=35)	26% in 13A west (n=50); 30% in 13C (n=10); 25% in 13E (n=28)
Year 15	2015	29% in 13A and 13B (n=21)	22% in 13A (n=9) 28% in 13B (n=32)
Year 16	2016	59% in 13A and 13B (n=29)	29% in 13A (n=7) 41% in 13B (n=34)
Year 17	2017	50% in 13A and 13B (n=30)	4% in 13A (n=48)
Year 18	2018	23% in 13A (n=13); 21% in 13B (n=34); 56% in 13E (n=25)	-
Year 19	2019	25% in 13A (n=12); 47% in 13B (n=30); 64% in 13E (n=22)	-
Year 20	2020	31% in 13A (n=13); 35% in 13B (n=26); 63% in 13E (n=16)	-
Year 21	2021	40% in 13A (n=8); 40% in 13B (n=16); 55% in 13E (n=11)	-

[a] Only cows three years of age and older were monitored.
[b] Only four flights were conducted in RY2011 (spring 2012), and some twins may have been missed.

No objectives on nutritional condition were identified in the *Intensive Management Plan.*

Evidence of trend:
There was an apparent increase in twinning rates during the first several years of the intensive management program, possibly a result of an increased likelihood of surveys detecting more obvious cows with twins before predation events. Flights were increased in RY2012–RY2022 to improve the likelihood of documenting twins. The low twinning rate detected among random parturient cows in 2017 is likely due to the late timing of the flight (June 4). Overall, twinning rates in 13B have been fluctuating in recent years while twinning rates in 13A remain relatively low and twinning rates in 13E are generally at medium to high levels.

Similar trend in nearby non-treatment areas: Unknown

5) Costs specific to implementing Intensive Management

Table 7. Cost ($1000 = 1.0) of agency salary based on estimate of proportional time of field level staff and cost of operations for intensive management activities (e.g., predator control or habitat enhancement beyond normal Survey and Inventory work) performed by personnel in the Department or work by other state agencies (e.g., Division of Forestry) or contractors in Unit 13 Wolf Predation Control Area. Fiscal year (FY) is also 1 July to 30 June but the year is one greater than the comparable RY (e.g, FY 2010 is 1 July 2009 to 30 June 2010).

		Predation Control[a]		Other IM activities		Total IM	Research
Period	FY	Time[b]	Cost[c]	Time[b]	Cost[c]	cost	cost[d]
Year 11	2012	0.0	0.0	2.5	25.0	25.0	25.6
Year 12	2013	0.0	0.0	1.75	14.3	14.3	0.0
Year 13	2014	0.0	0.0	1.0	8.9	8.9	6.0
Year 14	2015	0.0	0.0	1.0	8.9	8.9	22.0
Year 15	2016	0.0	0.0	1.0	8.9	8.9	46.0
Year 16	2017	0.0	0.0	0.5	4.4	4.4	22.4
Year 17	2018	0.0	0.0	0.5	42.5	42.5	294.9
Year 18	2019	0.0	0.0	1.25	76.0	76.0	63.1
Year 19	2020	0.0	0.0	1.25	163.5	163.5	133.2
Year 20	2021	0.0	0.0	1.0	159.3	159.3	101.4
Year 21	2022	0.0	0.0	6.25	189.1	189.1	82.8

[a] State or private funds only.
[b] Person-months (22 days per month).
[c] Salary plus operations.
[d] Separate from implementing IM program but beneficial for understanding of ecological or human response to management treatment (scientific approach that is not unique to IM).

6) Department recommendations[2] for annual evaluation (1 February) following Year 21 **for Unit 13 Wolf Predation Control Area.**

Has progress toward defined criteria been achieved? Yes

Has achievement of success criteria occurred?
Population objectives were met in all treated subunits by 2010. The population estimate for Unit 13B dropped below population objective in 2013 and has remained below objective. All other subunits have remained within or above objective.

Calf-to-cow ratios in general have been below objectives in all subunits since program inception. In 2015 ratio objectives were met in Unit 13A and 13E while ratios remained below objectives in Units 13B and 13C. In 2016 calf ratios dropped below objectives in all subunits and have remained below objectives through 2022. Calf-to-cow ratios appear to be gradually declining over time in most treated subunits.

[2] Prior sections include primarily objective information from field surveys; Sections 6 and 7 involve professional judgment by area biologists to interpret the context of prior information for the species in the management area.

Bull-to-cow ratios were met in all four treated subunits through 2012. Bull-to-cow ratios declined below the minimum objective in 2013 in 13A, although ratios remained above the minimum objective in 13B, 13C, and 13E. In 2015, bull-to-cow ratios were again met in all treated subunits. The lowest ratios were observed in accessible portions of each subunit. In 2016, bull-to-cow ratios dropped below objective in 13A and remained above objective in all other subunits. In 2017, bull-to-cow ratios were above objective in all surveyed subunits except 13E. In 2018 bull-to-cow ratios dropped below objectives in 13A and 13C but were above objective in all other subunits. In 2019 bull-to-cow ratios dropped below objective in 13E and were above objective in all other surveyed subunits. Bull-to-cow ratios are stabilizing near objectives in 13A, 13C, and 13E, and are declining toward the objective in 13B. The control subunit of 13D maintains the highest bull-to-cow ratio annually, with an average of 83 bulls:100 cows over the most recent five years of survey data (2016, 2019–2022).

Since RY14, harvest objectives are being met in one of four treated subunits, with the Unit 13A harvest within objective range. The harvest for Unit 13E increased to a level not seen since RY1997 but has since decreased and does remain below the objective range. Harvest objectives were met in Unit 13B for the first time in RY16 but harvest has since dropped below objectives. Harvest is within objectives for the untreated subunit 13D.

Table 8. **Unit 13 IM population and harvest objectives and estimates.**

	Unit 13(A)	**Unit 13(B)**	**Unit 13(C)**	**Unit 13(D)**	**Unit 13(E)**
Harvest Objective	**210–420**	**310–620**	**155–350**	**75–190**	**300–600**
2021 harvest	285	185	77	75	186
Population Objective	**3,500–4,200**	**5,300–6,300**	**2,000–3,000**	**1,200–1,700**	**5,000–6,000**
2022 abundance index	3,621	3,677	2,943	1,063	5,273
Calf-to-cow Ratio Obj.	**25:100**	**30:100**	**30:100**	**30:100**	**30:100**
2022 observation	20	16	15	16	13
Bull-to-cow Ratio Obj.	**25:100**	**25:100**	**25:100**	**25:100**	**25:100**
2022 observation	28	32	23	88	27

Recommendation for IM practice(s):

Predation control: Continue Modify Suspend Terminate
Continue with wolf control in each subunit as necessary based on moose and wolf population/harvest guidelines identified through the Board of Game process.

Habitat enhancement: Continue

Harvest strategy: Modify
Antlerless moose (cow) harvests are necessary to meet harvest objectives and to maintain populations within abundance and composition objectives. In the case the moose population

exceeds management objectives, and antlerless hunts are not approved through the Board of Game process, the IM program should be suspended in individual subunits.