OPERATIONAL PLAN FOR INTENSIVE MANAGEMENT OF MOOSE IN UNIT 19D EAST DURING REGULATORY YEARS 2020–2025

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DIVISION OF WILDLIFE CONSERVATION

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This operational plan has been prepared by the Alaska Department of Fish and Game (ADF&G) to provide supporting information on the intensive management (IM) plan for moose in Unit 19D East during regulatory years 2020 through 2025 (RY20–RY25; RY = 1 July–30 June, e.g., RY20 = 1 July 2020–30 June 2021). The IM plan for moose in Unit 19D East is found in Title 5 of the Alaska Administrative Code, Section 92, Part 123 (abbreviated as 5 AAC 92.123). Based on the biological and management information for this area (Appendix A), this operational plan describes rationale for evidence of limiting factors; choice of indices for evaluating treatment response; and decision frameworks for predation control, habitat enhancement, and prey harvest strategies. *Intensive Management Protocol* (ADF&G 2011) describes the administrative procedures and the factors and strategies in adaptive management of predator–prey systems to produce and sustain elevated harvests of caribou, deer, or moose in selected areas of Alaska. The IM plan for moose in Unit 19D East has been developed based on the recommendation of the McGrath Fish and Game Advisory Committee (McGrath AC) and at the request of the Alaska Board of Game (board).

BACKGROUND

To remedy low moose numbers and harvests, the board, adopted a wolf predation control plan in Unit 19D East (8,513 mi^2) beginning in the fall of 1995. Public wolf predation control began in RY03. The board updated and/or reauthorized the plan in January 2000, March 2001, March 2003, January 2006, May 2006, March 2009, and March 2014.

The most recent board action in March 2014 reauthorized the plan for a 6-year period from 1 July 2014–30 June 2020. No changes were made to the Wolf Control Focus Area (WCFA, 4,484 mi^2) or the Black and Brown Bear Predation Control Focus Area (BCFA, 528 mi^2) with the continued goal of focusing predation control efforts into an area where moose number can be better estimated, moose are accessible to hunters and harvest can be closely monitored. The Upper Kuskokwim Villages Moose Management Area (MMA, 1,118 mi^2) was eliminated and population and harvest objectives were established for the WCFA and BCFA. Finally, public bear control efforts which had been largely ineffective were not reauthorized.

Current IM objectives for all of Unit 19D East are for a moose population of 6,000–8,000 and an annual harvest of 400–600. The IM population objective has been achieved, but the IM harvest objective has not.

Several changes are made in this operational plan. First the Unit 19D East boundary in the vicinity of the Selatna River will be modified slightly (an increase of 57 mi^2) to make identification on the ground easier for the public. Second, the WCFA will be increased by 1,095 mi^2 to include the ranges of important boundary packs. Finally, population and harvest objects will both be established within the WCFA.

Moose numbers were estimated within the WCFA and BCFA using Geospatial Population Estimator (GSPE) techniques (Kellie and Delong 2006). Within the WCFA where wolf and bear control have been conducted, point estimates of moose numbers increased from 2,564 (0.5 moose/mi^2) in fall 2001 to 5,884 (1.1 moose/mi^2) in fall 2017 (Table 1).

Lethal predation control included aerial wolf removal by public permittees using airplanes and was conducted annually during 1 November–30 April, except during January 2006, when a lawsuit prompted a brief closure. Wolf control areas varied in size including 3,210 mi^2 (RY03–RY05); 6,245 mi^2 (RY06–RY08); and 4,484 mi^2 (RY09–RY19) (Figure 1). The department conducted nonlethal black and brown bear control within the BCFA during May 2003 and 2004 using ADF&G commissioner's authority. We reduced black bear numbers by 96% and brown bear numbers by 50% by translocating bears to other locations in Interior Alaska (Keech et al. 2011). Lethal bear control conducted by the public took place within the BCFA during RY06–RY14.

In Unit 19D East, Keech et al. (2011) demonstrated in a 3-predator, 1-large prey system, substantial predator treatments within a small area was an effective way to increase moose survival and population size. Subsequent to predator removals, harvest increased and Keech stated that managers and policymakers may expect similar results from predator treatment programs elsewhere, but use less costly and less thorough study designs (Keech 2012). Rationale for this IM Operational Plan is based on that research.

Table 1. Estimates from fall moose surveys in the 19D East Moose Survey Area (MSA; 5,313 mi^2), 2001–2017.

Year	Estimate of observable moose (90% CI)	SCF ($n_{observed}$, $n_{available}$)	Estimate with SCF applied (90% CI)	Calves: 100 cows (90% CI)	Bulls:100 cows (90% CI)	Yearling bulls:100 cows (90% CI)	Total moose/mi^2
2001	2,148 (±556)	1.19 (32, 38)	2,564 (±726)	25 (±10)	34 (±17)	7 (±4)	0.5
2004	2,163 (±403)	1.27	2,744 (±661)	54 (±20)	31 (±13)	12 (±6)	0.5
2008	3,071 (±499)	1.27 (16, 20)	3,889 (±959)	41 (±15)	55 (±22)	17 (±6)	0.7
2017	5,316 (±746)	1.11 (27,30)	5,884 (±1,020)	37 (±12)	39 (±13)	N/A	1.1

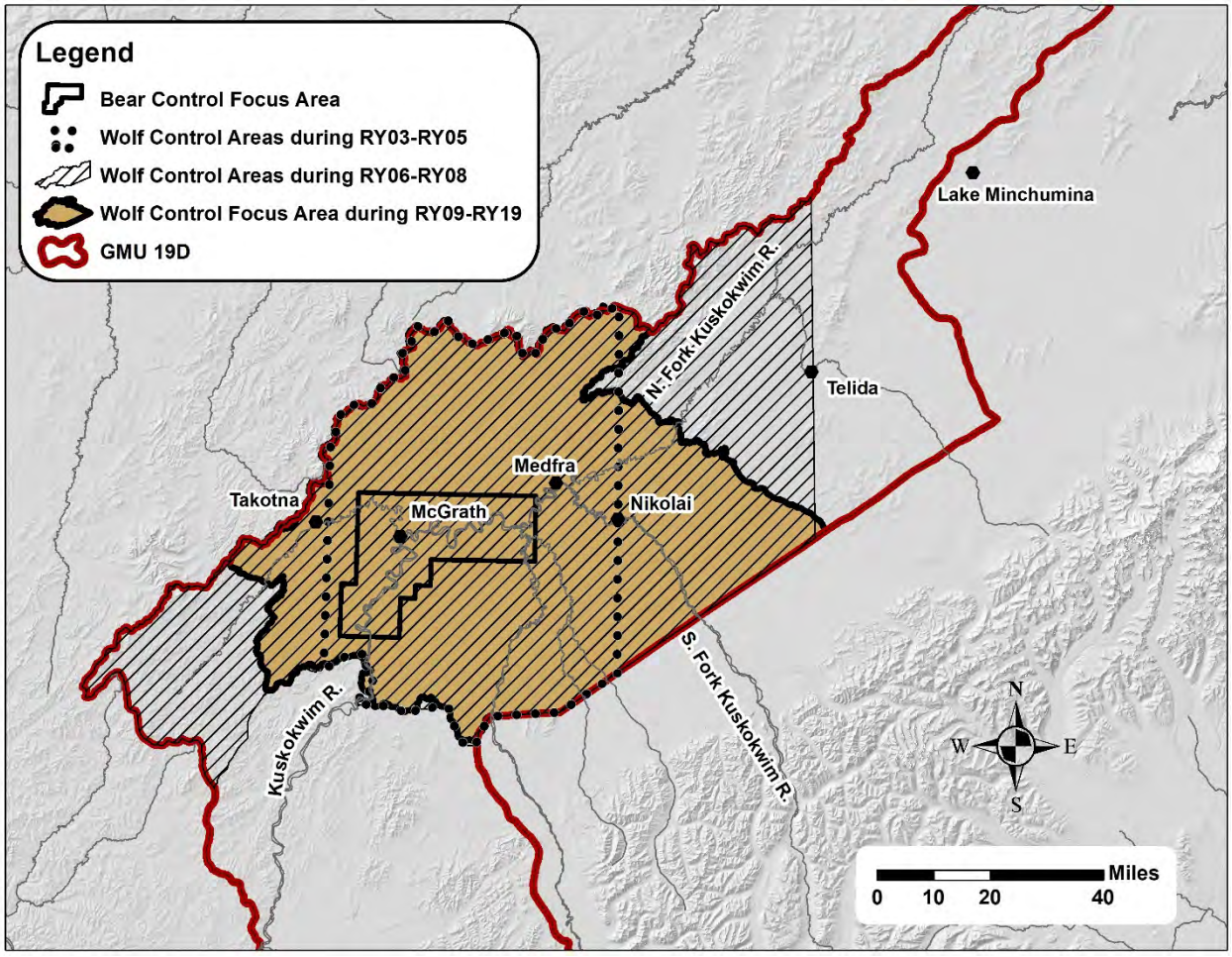

FIGURE 1. Unit 19D East wolf control areas in effect during RY03–RY05 (3,210 mi^2), RY06–RY08 (6,245 mi^2), and RY09–RY19 (WCFA 4,484 mi^2).

ADAPTIVE MANAGEMENT FRAMEWORK

Adaptive management is designing programs to maximize what can be learned from field experiments for potential application elsewhere, not simply modifying management in light of experience (National Research Council 1997:122). Managers wishing to use the best available information for management decisions or recommendations often need to generate new information for specific field situations (National Research Council 1997:174). Any section of the following framework may be modified as new information comes to light in the study area or the scientific literature. Lack of an anticipated response may require evaluation of additional criteria or a research project to understand which additional factors may be influencing the system and whether they are feasible to manage.

I. TREATMENTS

A. *Predation Control:*

Unit 19D East (8,569 mi^2) defines the population of wolves (Figure 2). The pre-control population was estimated in February 2001 through a minimum count wolf survey (Stephenson 1978) at 198 wolves. Wolf control may be conducted annually by issuing pilot and gunner permits to the public using aerial or land and shoot methods during November through April. Department control using aerial, land and shoot, or ground-based methods may also be conducted if public permittees are unable to achieve the control objective.

The WCFA (5,579 mi^2) defines where aerial wolf control may be conducted (Figure 2). The 2001 pre-control estimate within the WCFA is 130 wolves. The wolf control objective in the WCFA is to reduce wolf numbers by at least 60–80 percent of the pre-control estimate. Only removing wolves from the WCFA will ensure that wolves persist in Unit 19D East.

The BCFA (528 mi^2) defines where bear control may be conducted. If conducted, control will be done using aerial, land and shoot, or ground-based methods by the department only. Bear control objectives will be to temporarily reduce black and brown bear numbers to the lowest level possible. Because the area is small relative to Unit 19D East, the effect on the overall bear populations in the unit is insignificant. Meat and hides will be salvaged and distributed in Unit 19 communities.

Presently known alternatives to predator control for reducing the number of predators are ineffective, impractical, or uneconomical in the Unit 19D East situation. Hunting and trapping conducted under authority of ordinary hunting and trapping seasons and bag limits is not an effective reduction technique in sparsely populated areas such as this. Relocation of wolves and bears is impractical because it is expensive, and it is very difficult to find publicly-acceptable places for the relocated animals.

B. *Habitat Enhancement:*

No habitat enhancement projects are planned at this time. However, we will work with wildland fire managers to encourage them to allow wildfire where there are few conflicts with other land uses.

Based on available data, habitat does not appear to be a factor limiting abundance of moose in the WCFA. Within the BCFA however browse utilization rates are relatively high (Boertje et al. 2009) and a 2008–2009 survey of browse utilization found a removal rate of 40.5%. With increasing browse utilization there has been a drop in twinning rates and the 2018–2019 2-year average twinning rate was 16% within the BCFA.

C. *Prey Harvest:*

Twinning rates are a sensitive indicator of moose nutritional status (Boertje et al. 2009) and will be carefully monitored within the BCFA. If the 2-year average twinning rate is >20% we will continue to promote growth. At a twinning rate of 15–20% the moose population will be

stabilized through harvest. If the 2-year average twinning rate is <15% the number of moose will be reduced through harvest. Predator control will be suspended if harvest alone is insufficient to reduce moose numbers.

The moose hunting season most in demand is the fall season. The area most in demand for this season includes the major rivers near McGrath, Takotna, and Nikolai which are primarily accessed by boat. Because of this demand and limited access, the BCFA can be prone to depressed bull:cow ratios. In addition, crowding can lower success rates as moose move beyond the river due to disturbance. A registration permit hunt with permits distributed prior to the season is currently in place for all of Unit 19D. A general season harvest ticket hunt is also in place outside the Upper Kuskokwim Controlled Use Area (UKCUA). The harvest ticket hunt area encompasses approximately 94% of Unit 19D and is in place to encourage harvest in areas where an underutilized harvestable surplus of moose exists.

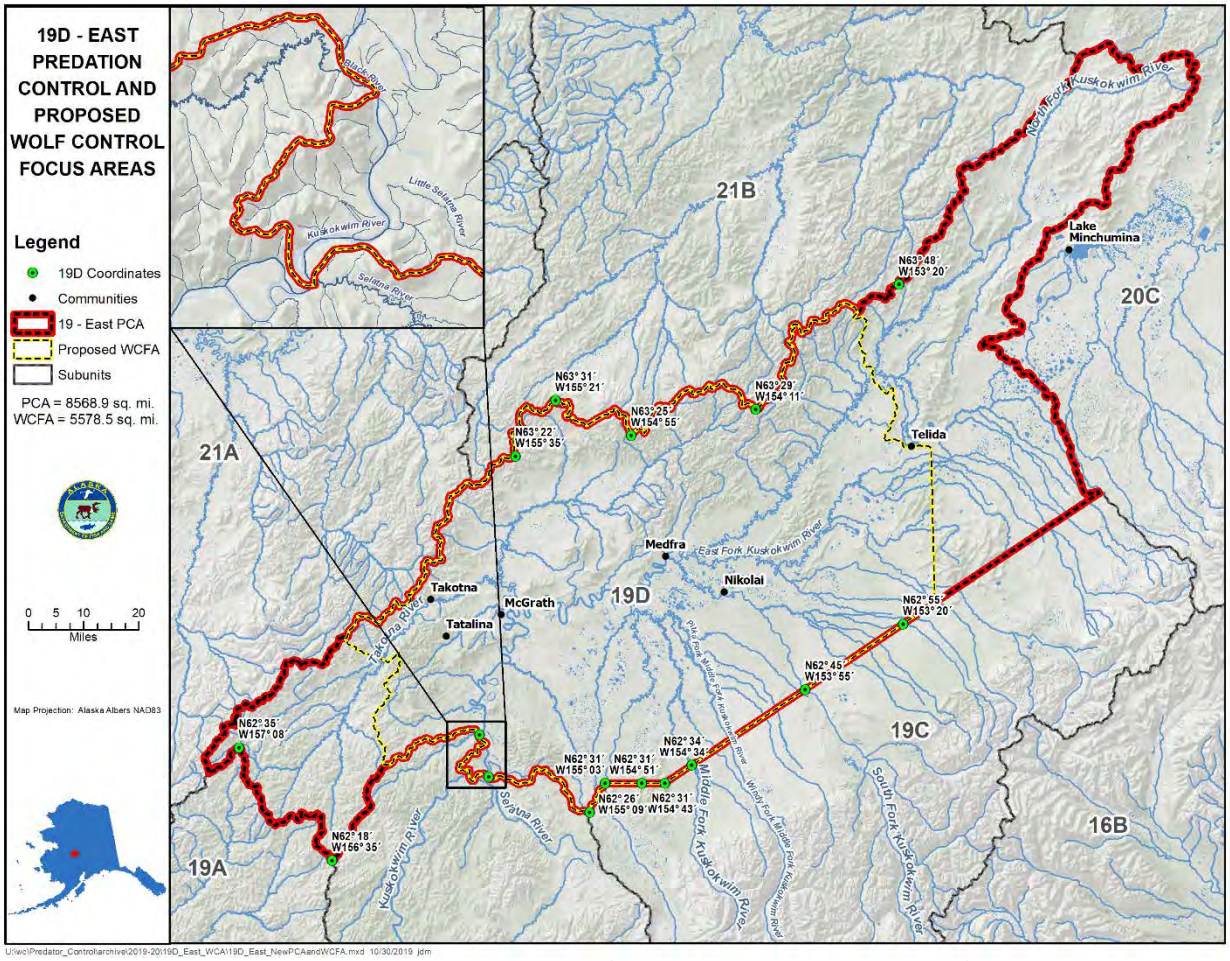

Figure 2. RY20–RY25 Unit 19D East (8,569 mi^2) and the WCFA (5,579 mi^2).

II. ANTICIPATED RESPONSES TO TREATMENTS

In Unit 19D East, Keech et al. (2011) demonstrated in a 3-predator, 1-large prey system, substantial predator treatments within a small area was an effective way to increase moose survival and population size. We anticipate similar results as we continue wolf and bear control in the same area.

A. *Predator Abundance:*

In May 2018, we estimated 31 wolves within the WCFA based on interviews with wolf control permittees. This represents an approximately 76% reduction from pre-control levels. However, wolves rebound quickly on an annual basis in the WCFA and it is anticipated wolf numbers would easily recover to pre-control levels in 3–5 years if wolf control were suspended (National Research Council 1997:52–53).

Based on the nonlethal bear removal program conducted in spring 2003 and 2004, the extrapolated estimate of the black bear population within Unit 19D East before the bear removal program was approximately 1,700 bears, including approximately 130 (96 independent bears; i.e. not including cubs) within the BCFA. Based upon the same removal program and extrapolations, the brown bear population within Unit 19D East before the bear removal program was approximately 128 bears, including approximately 9 within the BCFA.

After nonlethal black bear removal within the BCFA, the number of independent bears was reduced to 4, but they fully recovered to pre-control levels by 2010 (Keech 2012). This recovery occurred partially during years when public bear control using bucket mounted foot snares was active (RY09–RY13) in the BCFA. This indicates that removing a large percentage of black bears from a small area results in only a temporary (3–6 years) reduction in bear numbers. Subsequent removals by the department would be expected to provide similar results. In addition, because the BCFA is a relatively small geographic area, removing black bears from within it will have only a minor effect on the overall population in Unit 19D East.

Six of the estimated 9 brown bears in the BCFA were removed during the nonlethal program. Recovery was not monitored because of the few brown bears present. However, because the BCFA is a small geographic area, removal will have only a minor effect on the overall population in Unit 19D East.

B. *Predation Rate:*

The predation rate on moose in Unit 19D East was substantially reduced after combined bear and wolf control (Keech et al. 2011). During 2001 and 2002 black bears, brown bears and wolves killed 87 of 132 (66%) radiocollared moose calves. After predator control began in 2003 these predators killed 112 of 309 (36%) radiocollared moose calves (Keech 2012). We anticipate a similar predation rate reduction in the future.

C. *Prey Abundance:*

Moose abundance in 2017 was 1.9 moose/mi^2 within the BCFA and 1.1 moose/mi^2 within the WCFA based upon GSPE surveys (Kellie and DeLong 2006). Based on the case history of bear and wolf control in the plan area (Keech et al. 2011), we expect moose abundance to continue to increase in the WCFA. The expected increases in abundance will be utilized and regulated in accordance with principles in part E and F.

D. *Prey Recruitment:*

Moose annual survival was substantially increased after combined bear and wolf control (Keech et al. 2011). Moose calf annual survival increased from an average of 30% in the two years prior to predator removals to 45% during 2003–2010 following predator treatments (Keech 2012). Unit 19D East does have somewhat regular deep snow winters ($\geq$31 inches) which have been shown to reduce moose calf survival (Coady 1974) regardless of predator control (Keech et al. 2011).

E. *Prey Productivity or Nutritional Condition:*

Moose twinning rates will be monitored within the BCFA. If the 2-year average twinning rate is >20% we will continue to promote population growth. When 2-year average twinning rate is 15–20% moose density will be stabilized through harvest. If 2-year average twinning rate is <15% moose density will be reduced through harvest. Predator control will be suspended if harvest alone is insufficient to reduce abundance.

F. *Harvest:*

Harvest is accomplished using a combination of a general season harvest ticket and a registration permit hunt. Continuation of predation control will likely allow for higher levels of harvest through new seasons and bag limits. This additional harvest opportunity will be primarily available in the more lightly hunted portions of Unit 19D East outside the BCFA.

G. *Use of Nontreatment Comparisons:*

A similar adjacent nontreatment area is not available and no direct comparisons will be made.

H. *Other Mortality Factors:*

Deep snow years in excess of 31 inches (Keech 2012) were shown to be a significant factor in moose calf survival in Unit 19D East.

III. Evaluation Criteria and Study Design to Document Treatment Response

Adaptive management with the intent to increase harvestable surplus of prey requires evaluating the biological response and achievable harvest after treatments are implemented. Evaluation will be reported to the board annually at their February meetings.

A. *Predator Abundance and Potential for Return to Pre-treatment Abundance:*

The pre-control wolf population of 198 wolves or 23 wolves/1,000 mi^2 was estimated in February 2001 based on a minimum count reconnaissance style wolf survey within 5,000 mi^2 of Unit 19D East (Stephenson 1978); reported harvest; and extrapolation to the unsurveyed portions of Unit 19D East.

Wolf numbers within the WCFA are estimated using pilot interviews, harvest, and control data. In spring 2018, the post-control estimate was 31 wolves. Based on immigration and reproductive success, it is anticipated numbers will recover to pre-control levels in 3–5 years in the WCFA if control is suspended.

Pre-control black bear numbers were estimated at 96 independent bears using a removal estimator during bear removals in 2003. Immediate post-removal bear numbers were estimated at 4 independent bears in 2004. Subsequent estimates of 70 black bears in 2007 and 123 independent bears in 2010 were conducted using mark–recapture methods. Bears recovered to within 73% of pre-control levels 3 years post bear control and were fully recovered 6 years post bear control (Keech et al. 2012). It is anticipated that recovery from future bear reductions would be similar.

B. *Habitat and Forage Condition:*

Baseline browse surveys were conducted in March 2001 and 2003 (Paragi et al. 2008). By 2009 browse removal rates in the BCFA were 40.5% following increases in moose densities. Browse removal is a measure of competition for food by moose that is inversely correlated to nutritional condition (Seaton et al. 2011).

C. *Prey Abundance, Age and Sex Composition, and Nutritional Condition:*

The abundance objective within the WCFA is 1.0 moose/mi^2 (approximately 5,600 moose). Achieving it will meet our IM population objective of 6,000–8,000 moose in all of Unit 19D East.

Density is expected to be unequal across the WCFA because of variations in habitat quality and past focused management of bear predation in the BCFA. We will continue to assess moose abundance in the BCFA and the WCFA as the primary response metric with GSPE surveys conducted in fall. We intend to estimate a sightability correction factor (SCF) with each GSPE using radiomarked moose (Gasaway et al. 1986) or other appropriate techniques. We will design a survey that includes a high proportion of sample units in the BCFA, but also includes sampling of GSPE cells in the WCFA.

We will assess composition data in November within the BCFA. The nutritional condition of moose will be primarily monitored through twinning rates using radiocollared and non-collared females observed annually during late May surveys, also within the BCFA. The twinning rate will be calculated as the proportion of cows with twins or triplets from the sample of all cows with calves.

D. *Prey Harvest:*

The IM harvest objective for Unit 19D East is 400–600 moose. The moose harvest objective within the WCFA is 225. Hunter access is limited over much of the unit, therefore the IM harvest objective may not achievable. However, moose harvest within the BCFA and WCFA will contribute to the overall Unit 19D East IM harvest objective.

IV. DECISION FRAMEWORK TO IMPLEMENT OR SUSPEND A TREATMENT

A. *Predation Control:*

1. Prey Abundance.

The decision-making framework to initiate or suspend predator control will be based upon estimates of moose density in the WCFA and BCFA, and moose twinning rates in the BCFA.

The density objective for the WCFA is 1.0 moose/mi^2 (approximately 5,600 moose). If a moose GSPE point estimate is higher than the objective, wolf control may continue or be suspended after considering harvest and other biological factors such as twinning rates. If the GSPE point estimate is below the density objective wolf control may continue or be initiated if it has been suspended.

To remain proactive and ensure moose densities do not fall too low, a 1 to 2-year department conducted bear control effort may be conducted if a GSPE point estimate in the BCFA indicates the density is <1.2 moose/mi^2 and the 2-year average twinning rate is >20%. All GSPE surveys will be designed to achieve precision of at least $\pm$20% at the 90% confidence interval, but actual precision will vary with survey conditions and funding.

Twinning rates are an important indicator of moose nutritional status. If the 2-year average twinning rate is >20% we will continue to promote growth. When the 2-year average twinning rate is 15–20% moose density will be stabilized through harvest. If the 2-year average twinning rate is <15% moose density will be reduced through harvest. Predator control will be suspended if harvest alone is insufficient to stabilize or reduce abundance. Utilizing twinning rates will ensures that the moose density is appropriate for the amount of food available on the landscape.

2. Harvest Catch Per Unit Effort (CPUE).

CPUE will not be used to trigger management actions because many factors influence the number of days it takes for hunters to harvest a moose. These include, but are not limited to weather, water levels, fuel cost, the day of the week the season opens, reporting habits, as well as moose numbers and their distribution.

B. *Habitat Enhancement:*

We will not be using any habitat indices to initiate enhancement activities during this program period.

C. *Prey Harvest Strategy:*

1. Prey harvest.

There are currently 2 resident moose hunts and no nonresident hunts in Unit 19D East. Both resident hunts require reporting, whether or not hunters are successful. They include a harvest ticket hunt 1 September–20 September in Unit 19D, except within the UKCUA, and a registration permit hunt 1 September –25 September throughout Unit 19D.

2. Prey Nutritional Index.

Twinning rates are an important indicator of nutritional status in moose. We will monitor twinning within the BCFA and use 2-year average twinning rates in our decision making framework as described above. We will also consider any additional information available on nutrition such as calf weights, age of first reproduction, and age-specific pregnancy.

V. PUBLIC INVOLVEMENT

A. *Continued Outreach by Department:*

We will accomplish outreach through the state fish and game advisory committee and board processes. The McGrath AC is productively engaged with ADF&G during meetings, and the AC includes members who regularly communicate with us through visits, volunteering during field projects, phone calls, and participating in educational programs. There is sufficient participation by members of this committee and community interest in its activities, including participation by other agencies, that this platform for public involvement is appropriate. Input for all other advisory committees will also be encouraged.

B. *Continued Engagement to Confirm Criteria Chosen for Evaluating Success:*

We will continue to engage the McGrath AC, board, and ADF&G staff as we apply criteria chosen for evaluating success including achieving and evaluating moose numbers and harvest in the WCFA.

C. *Participation in Prey and Predator Harvest or Predator Control:*

The public has participated in aerial wolf control and bear snaring through permits issued by the department. Wolf reductions by the public have been effective, however, if public aerial wolf control cannot meet removal objectives, then the department may conduct additional wolf removals. Bear snaring by the public has not been effective and if considered, bear control would only be conducted by the department.

Local hunters and trappers will be encouraged to continue harvest of wolves and bears to help regulate the numbers post-treatment to prolong the effectiveness of predation control. Predator harvest incentive programs initiated and funded by Alaska Native corporations have been in place and are also encouraged.

D. *Monitoring and Mitigation of Hunting Conflict:*

Hunter conflicts have the most potential to occur within the UKCUA and are currently addressed as described earlier. Most of the demand comes from hunters living along the entire length of the Kuskokwim River and diffusing this conflict is best accomplished by increasing moose numbers along the entire length of the river.

VI. OTHER CONSIDERATIONS

As stated, hunter conflicts are best resolved by increasing moose numbers along the entire length of the Kuskokwim. In Unit 18, moose numbers are increasing within the Kuskokwim River drainage as well as along the Yukon. Both areas provide opportunity for the large number of hunters living there. As that moose population grows, and hunting opportunity along the Kuskokwim in Unit 18 increases, the demand for moose in Unit 19D East by hunters living downriver is likely to decline. This is the most likely and best scenario for mitigating hunter conflicts in Unit 19D East, however, increasing moose numbers in Unit 18 is beyond the scope of this plan.

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APPENDIX A. Summary of supporting information.

Geographic Area and Land Status	
Management area(s)	Prey abundance assessment (WCFA; 5579 mi^2), prey harvest assessment (WCFA; 5,579 mi^2), predator abundance assessment (WCFA; 5,579 mi^2), predator control focus areas (WCFA; 5,579 mi^2; BCFA; 528 mi^2) – Figure 1
Land status	WCFA is mostly in state or Native corporation ownership.
Biological and Management Situation	
Prey population	19D East IM population objectives: 6,000–8,000 moose Estimate in 2017: 8,540 moose
Prey harvest (human use)	19D East IM harvest objectives: 400–600 19D East average harvest RY14–RY18: 143 moose Unit 19 Amount necessary for subsistence: 400–700 moose, including 175–225 in Unit 19A, 20–24 in Unit 19B and 30–40 within the Lime Village Management Area
Feasibility of access for harvest	Access for harvest exists readily available by boat and snowmachine, and to a lesser extent, by 4 wheeler and highway vehicle. Landowner restrictions are few. Wolf numbers have been successfully reduced since RY03.
Nutritional condition	2-year average twinning rates in BCFA during 2018–2019 was 16%.
Habitat status and enhancement potential	No enhancement is anticipated.
Predator(s) abundance	Wolf numbers in WCFA in May 2018: 31 based on permittee interviews Bear numbers within the BCFA in 2016: 97

Geographic Area and Land Status	
Predator(s) harvest	Reported in Unit 19D East in RY18: Wolf take and reported harvest Unit 19D East: 63 Black bear take and reported harvest: 4 Grizzly bear take and reported harvest: 0
Evidence of predation effects	Keech et al. (2011) demonstrated in a 3-predator, 1-large prey system, substantial predator treatments within a small area was an effective way to increase moose survival and population size
Feasibility of predation control	Subsequent to predator removals, harvest increased. Keech (2012) stated that managers and policymakers may expect similar results from predator treatment programs elsewhere, but use less costly and less thorough study designs
Other mortality	Deep snow winters