OPERATIONAL PLAN FOR INTENSIVE MANAGEMENT OF MOOSE IN GAME MANAGEMENT UNIT 19(A) DURING REGULATORY YEARS 2014–2019

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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 Game Management Unit (GMU) 19(A) during regulatory years (RY) 2014–2020 (RY = 1 July–30 June, e.g., RY14 = 1 July 2014–30 June 2015). The IM plan for moose in GMU 19(A) is found in Title 5, 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 the rationale for evidence of limiting factors; choice of indices for evaluating treatment response; and decision frameworks on implementation, suspension, or termination 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-habitat systems to produce and sustain elevated harvests of caribou, deer, or moose in selected areas of Alaska. The IM plan for moose in GMU 19(A) was developed based on the recommendation of the Stony/Holitna Fish and Game Advisory Committee (SHAC) and at the request of the Alaska Board of Game (BOG).

BACKGROUND

The moose population in Unit 19(A) declined beginning in the early 1990s; conflicts between users intensified, and moose hunting regulations became more complicated. These conflicts led to the creation of the Central Kuskokwim Working Group, made up of representatives of multiple user groups, and the development the Central Kuskokwim Moose Management Plan (CKMMP), which was finalized in June 2004. Currently there is a Tier II hunt (TM684) in the Lime Village Management Area (LVMA) and a Tier II hunt (TM680) downstream from and including the George River drainage and downstream from and excluding the Downey Creek drainage. The remainder of Unit 19A is closed to all moose hunting (Fig 1).

A wolf control IM plan was first adopted by the BOG in March 2004 for the Central Kuskokwim and consisted of Units 19(A) and 19(B). It was approved for 5 years and began on July 1, 2004. The BOG approved a predator control program and the commissioner issued public aerial shooting permits or public land and shoot permits as methods of wolf removal pursuant to AS 16.05.783. In January 2006, the BOG adopted a revised IM plan in the form of an emergency regulation. The emergency regulation limited control activities to Unit 19(A) to make it consistent with the BOG's previous findings that implemented wolf control in Unit 19(A) only. Also, the emergency regulation clarified and updated key components of the plan that included: wildlife population and human use information, predator and prey population levels and objectives, plan justifications, methods and means, time frame for updates and evaluations, and miscellaneous specifications. In May 2006, the BOG further modified the emergency regulation and adopted it as a final regulation. Authorization to issue public aerial shooting permits or public land and shoot permits was reaffirmed, and the following Unit 19A prey and predator population estimates and objectives were specified.

- 2006 moose estimate: 2,700–4,250
- IM moose population objective: 7,600–9,300.
- fall 2004 precontrol wolf estimate in 19A: 125–150
- wolf control objective: 30–36 remaining in the spring

In March 2009, the BOG reauthorized the predation control IM plan for a period of 5 years, from July 1, 2009 through June 30, 2014. This plan established the Central Kuskokwim Villages Moose Management Area (CKVMMA), generally within the drainages of the Holitna, Hoholitna, and Stony Rivers to focus IM activities in a relatively small, accessible area of eastern Unit 19(A) (Fig.1). Currently, wolf control is only conducted within this area. The BOG also updated the moose population estimate in Unit 19(A) to 3,200–5,275, based upon a March 2008 survey.

In March 2012, the BOG amended the IM plan, establishing a 3,905 mi^2 Wolf Control Focus Area (WCFA) and adding black and brown bear control within a 534 mi^2 Bear Control Focus Area (BCFA). The WCFA was the same area as the CKVMMA, and the BCFA was mostly within the WCFA. The following prey and predator abundance estimates and objectives were also specified.

- Unit 19(A) 2011 moose population estimate update: 2,791–5,782
- Spring 2012 precontrol black bear numbers for all of Unit 19(A) and within the BCFA: 2,500–3,000 and 135–160
- Spring 2012 precontrol brown bear numbers for all of Unit 19(A) and within the BCFA: 180–210 and 10–15
- Black and brown bear control objectives within the BCFA: reduce bear numbers as low as possible, recognizing that reductions within this relatively small area will have only a minor effect overall on black and brown bear density in Unit 19(A).

ADF&G is currently monitoring radiocollared cow moose within the WCFA, to facilitate estimates of parturition, calf survival, twinning rates and sightability. Additionally, ADF&G conducts moose composition surveys as well as density estimates within the WCFA and the BCFA.

ADAPTIVE MANAGEMENT FRAMEWORK

Adaptive management is a process in which programs are designed to maximize what can be learned from management actions 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:*

Wolf control has been ongoing in Unit 19(A) since 2004 and since 2009 only within the WCFA (Fig. 1). The objective within the WCFA during the plan life is to temporarily reduce wolf numbers to the lowest level possible. The precontrol abundance estimate is 75–100 wolves. In the WCFA public permittees have successfully reduced numbers by 60–80% over all years. Except for on some private land, Alaska residents with a permit from ADF&G are authorized to use fixed-wing aircraft to shoot either while airborne or after landing. If public permittees are unable to successfully remove at least 60% of wolves from the WCFA, the department will consider a removal effort by staff using helicopters to supplement public efforts.

ADF&G is currently required to assure 30–36 wolves remain in all of Unit 19(A). At reauthorization of this plan, the new requirement will be 25–30 wolves. Based on information from previous wolf surveys, the current size of the WCFA ensures 25–30 wolves will remain in Unit 19(A) even if all wolves within the WCFA are removed.

To date, ADF&G has not been able to measure any response in moose abundance with wolf control alone. Therefore, based upon research conducted nearby in Unit 19D East (Keech et al 2011), it was determined that a reduction in bear numbers would also be required.

The objective within the BCFA during the plan life is to temporarily reduce black and brown bears to the lowest level possible. Control began in May 2013, with the lethal removal of 84 black bears and 5 brown bears from the BCFA (Figure 1) by department personnel. Bears were located using fixed-wing aircraft and then shot from a helicopter. Meat and hides were salvaged. Meat and small hides ($\leq$ 5 ft squared) were distributed in Unit 19(A) communities. Large hides were taken to Fairbanks for sale at a state auction. Eight black bear sows with cubs of the year were not killed. Control will be conducted again in May 2014, using the same methods.

The precontrol estimate in the BCFA was 135–160 black and 10–15 brown bears. The relatively small number of bears removed in comparison to 2,500–3,000 black and 180–210 brown bears in Unit 19(A) ensures a minor effect on the subunit-wide population. Bear hunting will continue throughout the area, but harvest is low.

Presently known alternatives to predator control for reducing the number of predators are ineffective, impractical, or uneconomical in the Unit 19(A) 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. Habitat manipulation would be ineffective because low density means competition for food is low; it is poor survival, not poor birth rate that keeps moose populations low in rural areas of the Interior Alaska. Also, stocking of moose is impractical because of capturing and moving expenses and risk of disease transmission.

B. *Habitat Enhancement:*

Based on available data, habitat does not appear to be a factor limiting population growth of moose in the WCFA. The most recent twinning survey conducted by ADF&G in 2013 found a twinning rate of 56% within the BCFA. A 2006 survey of browse utilization found low browse removal rates in Unit 19(A) (Paragi et al 2008). Since habitat does not appear to be limiting at this time there are no habitat enhancement projects proposed as part of this plan.

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 rate of 15-20% the number will be stabilized through harvest. If the 2-year average twinning rate is <15% number of moose will be reduced through harvest. Predator control will be suspended if harvest alone is insufficient to reduce moose numbers.
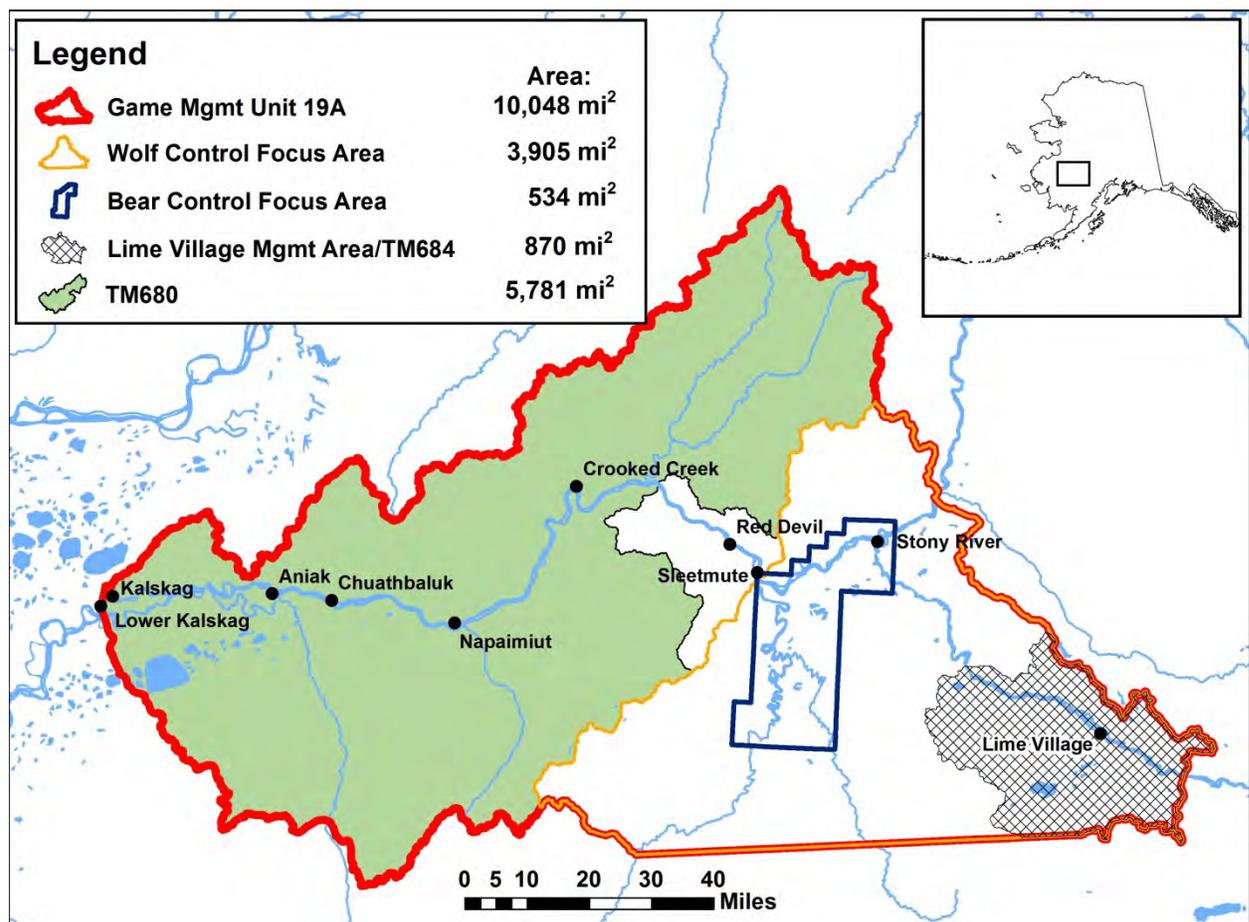

Figure 1. Unit 19(A), the Wolf Control Focus Area (WCFA), the Bear Control Focus Area (BCFA), the Lime Village Management Area (LVMA), and Tier II moose hunts (TM680 and TM684).

II. ANTICIPATED RESPONSES TO TREATMENTS

A. *Predator Abundance:*

In February 2008, a wolf survey in Unit 19(A) resulted in an estimate of 74 wolves in 17 packs. This is approximately 0.74 wolves per 100 square miles. A fall 2010 estimate was determined using a February 2011 aerial wolf survey, pilot interviews and harvest and control data. This resulted in an estimate of 30 wolves in 7 packs in the WCFA and approximately 80 wolves in all of Unit 19(A). With 50 wolves outside the WCFA, we are assured the minimum 25–30 wolves remain in Unit 19(A) even after reducing wolves to the lowest level possible in the WCFA. Based on wolf immigration and reproductive success, it is anticipated wolf numbers would recover to pre-control levels in 3–5 years in the WCFA if wolf control were suspended (National Research Council 1997:52-53).

Based on extrapolation of densities from other areas, an estimated 2,500–3,000 black bears exist in Unit 19(A), including approximately 135–160 black bears within the BCFA. Based on the same extrapolations, an estimated 180–210 brown bears exist in Unit 19(A), including approximately 10–15 brown bears within the BCFA. Bears in the McGrath area recovered quickly after removal efforts in 2003 and 2004 (Keech et al 2011) and it is anticipated bear numbers in the BCFA will recover to pre-control levels within 5–7 years. In addition, because the BCFA is a relatively small geographic area, removing bears from within it will have only a minor effect on the bear populations in Unit 19A overall.

B. *Predation Rate:*

Predation rate on moose in Unit 19(D) East was substantially reduced after combined bear and wolf control (Keech et al 2011). We anticipate a similar rate reduction in the Unit 19A BCFA. We will monitor summer calf survival in the area by determining the number of calves for individual radio collared cows in the spring. Follow up flights in the fall will then be used to assess over summer survival. Annual spring twinning and fall composition surveys will be attempted as well as less frequent density estimates in the BCFA and WCFA. These data will help to further assess intended effectiveness of the IM program.

C. *Prey Abundance:*

Moose abundance within the WCFA was estimated at 0.43 moose/mi^2 (1,679 Moose) in March 2011. Based on the case history of bear and wolf control in Unit 19D East (Keech et al. 2011), we expect moose abundance to increase in the WCFA, but predominantly within and adjacent to the BCFA. The expected increases in abundance will be utilized and regulated in accordance with principles in part E and F.

D. *Prey Recruitment:*

We expect calf moose survival to increase in the BCFA if bear abundance is significantly reduced. This will in turn lead to increased recruitment of calves into the yearling age class and higher moose numbers.

E. *Prey Productivity or Nutritional Condition:*

Over summer calf survival will be monitored as part of this plan as well as twinning rates. With collared females and an anticipated increase in moose densities we should be able to obtain sufficient sample sizes to monitor twinning rates within the BCFA. If the 2-year average twinning rate is >20% we will continue to promote growth. At a rate of 15–20% the number will be stabilized through harvest. If the 2-year average twinning rate is <15% number of moose will be reduced through harvest. Predator control will be suspended if harvest alone is insufficient to reduce moose numbers.

F. *Harvest:*

Bear and wolf reduction should result in an increase in harvestable surplus. However, harvest is currently restricted to Tier II hunts TM684 (LVMA) and TM680 (western Unit 19(A)). The remainder of Unit 19(A), including the WCFA outside of the LVMA, is closed to hunting because of very low moose density.

Only Tier II hunts are currently in place because harvestable surplus of moose is lower than the ANS, and the board has determined that reasonable opportunity for subsistence has not been met. In the LVMA, ANS is 30–40 moose; and in Unit 19(A), outside of LMVA, it is 175–225. Bear and wolf control may result in an increase in harvestable surplus sufficient to allow the BOG consideration of various hunt alternatives.

G. *Use of Nontreatment Comparisons:*

A similar adjacent nontreatment area is not available and no direct comparisons will be made. However, results of routine surveys in the western portion of Unit 19A and research planned in Unit 19(D) East will provide useful moose population size, trend, composition and mortality data for comparisons to help evaluate treatment.

H. *Other Mortality Factors:*

Deep snow years in excess of 31in (Keech 2012) were shown to be a factor that may lower recruitment during some years in Unit 19(D) East, and deep snow may also be a factor in the Unit 19(A) WCFA as well.

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 (Walters 1986). Evaluation will be reported to BOG on 1 February each year with an interim update of selected criteria on 1 August each year.

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

The wolf population in Unit 19(A) was estimated in February 2008 using an aerial census (Stephenson 1978) in which a total of 74 wolves were estimated in 17 packs. This is approximately 0.74 wolves per 100 square miles. A fall 2010 estimate was determined using a February 2011 aerial census, pilot interviews and harvest and control data. This resulted in an estimate of 30 wolves in 7 packs in the WCFA and approximately 80 wolves in all of Unit 19(A). With 50 wolves outside the WCFA we are assured the minimum 25–30 wolves remain in Unit 19(A) even after reducing wolves to the lowest level possible within the WCFA.

Wolf numbers within the WCFA are estimated annually using pilot interviews and harvest and control data. In spring 2013, the post-control estimate was 22. 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.

Based on extrapolation of densities from Unit 19(D) East and Unit 20(A), an estimated 2,500 - 3,000 black bears exist in Unit 19(A), including approximately 135 - 160 within the BCFA. Also based on an extrapolation of densities from other areas, an estimated 180 - 210 brown bears exist in Unit 19(A), including approximately 10 - 15 within the BCFA. As part of the bear control effort in 2013 data were collected to better assess black bear numbers within the BCFA using a removal estimator. These data will be collected again in 2014 and a more precise pre-control estimate of black bears will be developed.

Bears in the McGrath area 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 bear numbers in the BCFA will recover to pre-control levels within 5–7 years.

B. *Habitat and Forage Condition:*

A baseline browse survey was conducted in March 2006 (Paragi et al 2008). While no forage assessment studies are currently scheduled for this program, studies will be conducted if we detect declines in twinning rates below 20%.

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

An abundance objective of 2.0 moose/mi^2 (approximately 1,068 moose) is established within the BCFA. Achieving this objective will contribute to achieving our IM population objective of 7,600–9,300 moose in all of Unit 19(A).

We will evaluate whether continued aerial wolf control by the public each winter and aerial bear control by the Department (spring 2013 and spring 2014) can achieve the BCFA and also promote overall growth in the surrounding WCFA. Moose density is expected to be unequal across the WCFA because of variations in habitat quality and focused management of bear predation in the BCFA. We will continue to assess moose abundance in the BCFA as the primary response metric and in the WCFA with GeoSpatial Population Estimator (GSPE) surveys (Kellie and DeLong 2006) conducted in late winter. We recognize the challenges of observing moose in late winter surveys (e.g., shadows in dense cover on sunny days) and

intend to estimate a sightability correction factor (SCF) with each GSPE using radio-marked moose (Gasaway et al. 1986) or other appropriate techniques. Based on findings in Unit 19(D) East (Keech et al. 2011), we expect it may take 4-6 years of increasing moose before we are able to detect a change in this low density population. 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 survey the BCFA and WCFA at intervals to be determined by other area priorities as well as funding. A BCFA survey is scheduled for March 2014. Additional surveys will be conducted at least once in each area during the life of this plan

We will assess composition data annually in November, within the BCFA, using methods described by Seavoy (2010). We expect an increase in the ratio of calf moose to adult females in the BCFA where there will be bear and wolf control combined. These surveys will also be used to assess bull to cow ratios, which we expect to be relatively high (> 30:100) because this area is closed to moose hunting.

The nutritional condition of moose will be primarily monitored through twinning rates using radio-collared and non-collared females observed annually during late May surveys (Seavoy 2010). Forty-three cows were radio-collared during October 2012 and April 2013. We will attempt to maintain a minimum of 30–40 collars, depending upon funding.

D. *Prey Harvest:*

The IM harvest objective for Unit 19(A) is 400–550 moose.

Reported harvest over the last 5 years in the TM 684 and TM680 hunts, averaged 84 (range 66–115). Access is difficult over much of the Unit, and it is impractical to conduct predator control over the entire area. Therefore, this objective may not achievable. However, moose harvest within the BCFA and WCFA will contribute to the overall Unit 19(A) harvest.

A harvest objective of 120 moose annually is established within the WCFA, outside of the LVMA. Moose harvest will be assessed using hunter reports.

IV. **DECISION FRAMEWORK TO IMPLEMENT OR SUSPEND A TREATMENT**

A. *Predation Control:*

1. <u>Prey Abundance</u>.

The decision making framework to initiate or suspend predator control will be based upon estimates of density and twinning rate within the BCFA.

The density objective for the BCFA is 2.0 moose/mi^2 (1,068 moose). If a moose GSPE point estimate is higher than the objective, wolf control may be suspended after considering other biological factors such as twinning rates. Wolf control may continue, or be initiated if it has been suspended, if the GSPE point estimate is below the density objective and twinning rates are >20%. This ensures that moose density is appropriate for the amount of food available on the range.

To remain proactive and ensure density does 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/mile^2 and 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.

While wolf control may be applied for multiple successive years, the implentation of bear reductions will depend on progress toward moose harvest objectives 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 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.

2. Prey 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.

The harvest objective within the WCFA, outside of LVMA, is 120 moose annually. If this objective is achieved, a combination of allowable harvest in this area and in the TM680 hunt area will provide sufficient harvest to allow BOG consideration of various hunt alternatives.

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. 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:*

The Department will accomplish outreach through the state fish and game advisory committee and BOG processes. Local advisory committees have been actively involved

in moose management in Unit 19(A) and serve as good platform for public education. Input from all committees will be encouraged.

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

We will continue to engage the advisory committees, BOG and ADF&G staff to evaluate the success of this program. One of the objectives of this operational plan is to increase moose harvest in the WCFA.

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

Public aerial wolf control has been successful in reducing wolves and will continue to be the primary method of wolf reductions in the WCFA. If at some time in the future, public aerial wolf control cannot meet removal objectives, then the Department may conduct additional wolf removals using a helicopter. We do not expect ground based efforts to be successful in this remote area.

Bear removal was conducted by the Department within the BCFA during May 2013 and is planned for May 2014. Meat and hides will be salvaged from as many bears as possible, with meat and small hides distributed to Unit 19(A) communities and large hides sold at a state auction. Department sponsored bear removal is currently considered the only method available to meet objectives.

D. *Monitoring and Mitigation of Hunting Conflict:*

Advisory committee and BOG processes will be used to monitor and mitigate user conflict. Communication between committees and other stakeholders will be encouraged.

VI. OTHER CONSIDERATIONS

The bear control conducted in 2013 required considerable resources including financial and ADF&G staff time. This will be a major consideration in the future if additional bear control efforts are necessary. Additionally, a significant hurdle to bear control activities involved gaining access to critical private lands. Without this access in the future, bear control would likely be ineffective. Finally, if public permittees are not successful in reducing wolf numbers below the objectives within the WCFA, department conducted wolf control will be conducted. As with bear control, access to private lands would be important.

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APPENDIX A. Summary of supporting information for Unit 19(A).

Geographic Area and Land Status	
Management area(s)	Prey abundance assessment (534 mi^2), prey harvest assessment (3,905 mi^2), predator abundance assessment (3,905 mi^2), predator control focus areas (wolves 3,905 mi^2 and bears 534 mi^2) – see Figure 1
Land status	Federal, State and Private
Biological and Management Situation	
Prey population	Unit 19(A) IM objectives: 7,600–9,300 moose WCFA estimated in 2011: 1,666 (±36% with 90% CI) moose
Prey harvest (human use)	Unit 19A IM harvest objectives: 400–550 115 moose harvested in Unit 19(A) in 2012 Unit 19(A) outside of LVMA amount necessary for subsistence 175–225 LVMA amount necessary for subsistence 30–40
Feasibility of access for harvest	There are extensive private lands along most of the major drainages within Unit 19(A). Fuel is available in Aniak and Sleetmute but the cost is high. There are very few trails and no roads so access is limited to river travel. Due to these factors access is primarily limited to shareholders of local native corporations and other residents along the Kuskokwim river.
Nutritional condition	Twinning rate in BCFA 56% in 2013.
Habitat status and enhancement potential	Browse biomass removal was 10% (95% CI: 6-18%) in 2006. Wildfire and floods regularly reset habitat to early successional stages, so no habitat enhancement is anticipated.
Predator(s) abundance	WCFA estimated in 2012: Wolves 22, BCFA estimated in 2012: Black bears 135–160, Grizzly bears 10-15
Predator(s) harvest	Reported in RY 12: Grizzly bear 12, Black bear 86, Wolves 4
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	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.
Other mortality	Deep snow winters.