FEDERAL AID
FINAL PERFORMANCE REPORT

ALASKA DEPARTMENT OF FISH AND GAME
DIVISION OF WILDLIFE CONSERVATION
PO Box 115526
Juneau, AK 99811-5526

Alaska Department of Fish and Game
Wildlife Restoration Grant

GRANT NUMBER: AKW-10 Wildlife Restoration

PROJECT NUMBER: 1.71

PROJECT TITLE: Calf Production and Survival of Moose in GMU 16

PROJECT DURATION: 1 July 2011 to 30 June 2016

REPORT PERIOD: 1 July 2011 to 30 June 2016

REPORT DUE DATE: December 28, 2016

PRINCIPAL INVESTIGATOR: Todd Rinaldi and Tim Peltier

WORK LOCATION: Game Management Unit 16B

I. PROBLEM OR NEED THAT PROMPTED THIS RESEARCH

Before 1940, moose were uncommon in Unit 16B. After that time, habitat changes and federal predator control allowed the population to increase (Griese 1995). Moose populations fluctuate greatly in Unit 16B due to heavy snow years that seem to occur once or twice every decade. Moose in this unit likely numbered in excess of 10,000 during the early 1980s (Griese 1996). Before the severe winter of 1989–1990, there likely were 8,500–9,500 moose (Harkness 1993). Moose declined in GMU16B following a series of hard winters in the late 1980s and early 1990s. Following the initial decline in the moose population, the results of several moose surveys in the area demonstrated a low calf to cow ratio and a lack of a response by the population to re-build in spite of winters that were relatively normal. It was suspected that predator populations in the area were reducing recruitment potential and resulted in a situation known as low density dynamic equilibrium.

For most of the post-statehood history of the unit, predation was not considered a significant factor limiting the moose population until around 1992, when an increase in the wolf population was first noticed. The minimum population estimate in 1993 was 39–42 wolves. A subsequent survey in the fall of 1998 estimated a population of 120–140 wolves (Masteller 2000), and Del Frate (2003) reported an estimate of 160–245 wolves for all of Unit 16 in the winter of 2001. As a result of increased wolf numbers and a decrease in the moose population, the influence of wolf predation on the moose population is believed to have increased over time. Under intensive management, a control program to reduce wolf predation on moose began in 2004. At that time, the population was estimated at 175–180 wolves (ADF&G 2015). Additionally, studies in

Unit 16B suggest that bear predation also has a strong influence on calf recruitment (Faro 1989; Peltier 2012). Black and brown bear surveys were conducted in spring of 2007 and indicated a very high density of black bears (182 bears/1000 km^2 and brown bears (63 bears/ 1000 km^2) in the unit (Peltier 2008). Brown bear season and bag limits were liberalized and a black bear control program began in the fall of 2007 (Peltier 2008, 2010). A separate brown bear control program on a 960 mi^2 portion of the unit between the Beluga and McArthur Rivers began in RY10 (Peltier 2013).

A study was developed to determine if this predation was a limiting factor for the moose population and if increased harvests of predators would reverse the situation and allow for an increase in the moose population. Pregnancy and twinning rates of moose indicate the potential for population increases and are indicators of habitat quality. This project was developed to evaluate calf production rates, moose survival rates, and evaluate forage parameters relative to population and harvest objectives. Predators have been harvested at various rates in different areas of the unit. This project investigated moose survival response to predator harvest. The project was also designed to evaluate forage conditions and nutritional status of moose relative to population size and population and harvest objectives to ensure sound management of moose in GMU 16.

II. REVIEW OF PRIOR RESEARCH AND STUDIES IN PROGRESS ON THE PROBLEM OR NEED

This project has been built upon previous studies of the area beginning with the initial collaring and calf production study efforts implemented in spring of 2005. During the first year of the project 67 moose were captured and radio collared via helicopter darting. Additional captures afterward brought the total sample size to 70–90 moose. Calf production and survival was defined by relocating the animals periodically from the start of calving in the spring through the following year. Beginning approximately two weeks before the peak of calving radiocollared cows are located and their reproductive status is determined. Cows were relocated daily or every other day to determine if they had single or twin calves. They were relocated after weaning at around four months of age to determine which calves survived through the summer.

Determining the causes of moose calf mortality can inform management decisions not only for moose but for bears, wolves and other predators as well. Investigations of the causes and locations of calf mortality could also shed light onto other questions regarding the vulnerability of calves based on weight, the presence of siblings, age of the dam, and location of the birth relative to other geographic and terrain features. Analysis of the parameters surrounding the causes of mortality could be used to assist in determining where and what species of predators the department should place reduction efforts in order to maximize the potential for increased calf recruitment. In 2010 staff captured 54 calves. Survival to fall of radiocollared calves was 0.24 (SE=0.07). Brown bear predation was responsible for 53% of the total mortality, black bears were responsible for 21% of the total mortality, unknown predators were responsible for 15% of the total mortality, and 11% died for other reasons.

III. APPROACHES USED AND FINDINGS RELATED TO THE OBJECTIVES AND TO PROBLEM OR NEED

OBJECTIVE 1: Estimate calf production, survival, and recruitment rates.

Approach: Following the approach of the previous study mentioned above we maintained a sample of 70–90 radiocollared cows. Calf production and survival was determined through relocating the animals periodically from the start of calving in the spring through the following year. Beginning approximately two weeks before the peak of calving radiocollared cows were located and their reproductive status was determined. Cows were relocated daily or every other day to determine if they had single or twin calves. They were relocated after weaning at around four months of age to determine which calves survived through the summer.

Findings: We monitored an average of 81 cows each year of the study. Parturition rate averaged 0.84 (SE=0.04), twinning rate averaged 0.54 (SE=0.06), and recruitment to fall increased from 20% in 2011 to 51% in 2015 (Table 1). The parturition rate and twinning rate did not identify any trends from the start of the project in 2005 through 2015, indicating that the increasing population has not had a negative effect on the habitat to the degree that twinning or pregnancy rates were reduced. We captured 16 short-yearlings in March of 2014. In the spring of 2015, 9 of the 14 remaining cows captured the previous spring had calves as 3-year-olds. Boertje et al. (2007) suggests that <50% of 36-month-old moose being parturient, and twinning rates below 0.20 are indicators of a nutrient limited population therefore we have evidence that habitat is not limiting population growth in Unit 16B.

Objective 2: Evaluate causes of calf mortality.

Approach: Cow-calf groups were located in spring 2012 with small fixed-wing aircraft in the southern portion of Unit 16B between the Beluga and MacArthur Rivers. Staff used a Robinson R-44 helicopter to conduct captures. Calves that appeared to be ≤ 5 days old were caught, weighed, VHF radiocollars were fit around their necks, and then released. Handling time was less than one minute. Calves were monitored daily, and when mortalities were detected staff went to the kill site to determine cause of death.

Findings: Staff captured 53 calves in 2012. Survival to fall for radiocollared calves was 0.19 (SE = 0.06). In 2012, brown bear predation accounted for 53% of total mortality, black bears took 33% of the total mortality, unknown predators were responsible for 6% of total mortality, and 8% died for other reasons. These results were consistent with previous work.

Objective 3: Monitor forage abundance and utilization to ensure moose are not over-abundant.

Approach: Monitoring forage utilization and forage plant condition enables an evaluation of the impact of increasing moose density on the available habitat and can serve as a signal to liberalize harvest in order to ward off the potential for severe habitat degradation and a subsequent crash in the moose population. Staff developed a browse survey plan based on the work of Paragi and Kellie (2011), and Seaton et al. (2011). Using the GeoSpatial Population Estimator survey grids of Unit 16B we would have randomly selected 30 units for sampling and access the plots with a Robinson R-44 helicopter. Flying a transect NW from a starting point in the SE corner of the unit we would fly until a suitable landing area was found and select a random bearing and distance from the landing point, fly to it, and if suitable habitat was found at that location, use that point as the center of the plot. If suitable habitat or no landing area was found that site would be rejected and a new unit would be randomly selected. For suitable units we would count preferred browse species and measure a subsample of preferred browse species. We would also record slope, aspect, and other data and take photos of each area.

Findings: Due to staffing and time limitations this work was not accomplished during the reporting period. However we do intend to complete this task in the future under a different federal aid project. We have monitored nutritional condition of individual cow moose using ultrasonography measurements of fat and lean tissue reserves, and body condition scores. We have monitored trend in condition of the moose population by monitoring pregnancy rates, twinning rates, and mass of 6 and 10-month old calves. Additionally we have other evidence that moose are not over abundant or being limited by nutrition as discussed in Objective 1.

Objective 4: Report findings in appropriate scientific and popular venues.

Approach: We analyzed the data to prepare a final DWC report and publications.

Findings: We completed the data analysis and have used the results in various department publications and have presented the results to the Alaska Board of Game. A final report for the grant is pending divisional review.

IV. MANAGEMENT IMPLICATIONS

The primary goal of this project was to determine which factors may be limiting the recovery of the moose population in Unit 16B and determine the potential for a population increase. In this regard investigating calf production and survival has defined the reason why the population was slow to rebound.

During the reporting period area staff completed aerial moose surveys on two-thirds of Unit 16B and the results indicated the moose population has recovered from declines witnessed in the early 2000s. Reasons for the recovery are not entirely understood, however increased take of predators through the liberalization of hunting regulations,

wolf and bear control programs, and mild winters may have worked separately or in concert to aid in the recovery of the population.

The annual monitoring of moose productivity and survival provided 'real time' feedback on the status of the moose population in Unit 16B and the findings of that work mirrored the increases in the aerial surveys. Area staff should continue to maintain a sample of radiocollared cows in the area and continue to monitor calf production, survival, and recruitment rates. This will help determine when the population may be approaching carrying capacity, and to determine if an increase in predators, a result of the discontinuation of the control program, has resulted in a significant decrease the calf recruitment. Information gained from this project along with population surveys of moose and their predators will help managers determine the appropriate levels of predator and prey harvest, thus achieving the department mission of improving game resources for the benefit of the people of the state–consistent with the sustained yield principle.

V. SUMMARY OF WORK COMPLETED ON JOBS

FROM PROJECT STATEMENT:

Objective 1: Estimate calf production, survival, and recruitment rates.

Job/activity 1a: Maintain a sample of radiocollared cows and monitor their annual calf production and calf recruitment.

Accomplishments: We determined the reproductive status of 70– 90 radiocollared cows several times a year during the course of the project. We captured and radiocollared 16 short-yearling cows in 2014 to be included in the study. The key findings have been included in Section III.

Objective 2: Evaluate causes of calf mortality.

Job/activity 2a: Capture and radiocollar neonate calves and determine survival or mortality factors.

Accomplishments: We captured 53 calves in the spring of 2012 and monitored them for survival through the summer to determine causes of mortality. Key findings have been included in Section III.

Objective 3: Monitor forage abundance and utilization to ensure moose are not over-abundant.

Job/activity 3a: Conduct forage surveys of browse availability and utilization.

Accomplishments: Although staffing and time limitations prevented implementation of the activity, evidence of twining rates > 0.20, 3 yo reproduction > 50%, and other factors discussed in Section III serve as surrogates for browse availability and nutritional condition.

Objective 4: Report findings in appropriate scientific and popular venues.

Job/activity 4a: Analyze data and prepare reports of the results.

Accomplishments: Data collection and analysis is ongoing. Some results have been included in management reports, operational plans and presented to the Board of Game. Further analyses need to be conducted and a final report and a manuscript of the results is pending.

VI. PUBLICATIONS

The report is in prep and a copy will be forwarded to the USFWS, and be accessible on the Alaska Department of Fish and Game website.

I. ADDITIONAL FEDERAL AID-FUNDED WORK NOT DESCRIBED ABOVE THAT WAS ACCOMPLISHED ON THIS PROJECT

None

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Table 1. Unit 16B moose parturition, twinning, and survival rates from radiocollared cows, 2005 to 2015.

Year	Cows observed	Single calves	Twins	Percent Twinning[a]	Percent Cows Parturient[a]	Calves alive in fall	Percent Recruitment to Fall[a]
2005	56	20	21	51 (15)	73 (12)	5	8 (7)
2006	66	32	24	43 (13)	85 (9)	13	16 (8)
2007	89	34	37	52 (12)	80 (8)	26	24 (8)
2008	89	32	31	49 (12)	71 (9)	12	13 (7)
2009	38	10	20	67 (17)	79 (13)	8	15 (9)
2010	43	19	17	47 (16)	84 (11)	6	11 (9)
2011	88	30	35	54 (12)	74 (9)	20	20 (8)
2012	89	36	36	50 (12)	81 (8)	28	27 (9)
2013	80	22	49	69 (11)	89 (7)	54	45 (9)
2014	70	34	30	47 (12)	91 (7)	40	44 (10)
2015	80	34	34	50 (12)	85 (8)	49	51 (10)

[a] 95% confidence interval, plus and minus the estimate, in parentheses.