

**FEASIBILITY ASSESSMENT FOR MAINTAINING OR
INCREASING SUSTAINABLE HARVEST OF NELCHINA
CARIBOU IN GAME MANAGEMENT UNIT 13**



Prepared by

DIVISION OF WILDLIFE CONSERVATION

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BACKGROUND

Nelchina caribou

The Nelchina caribou herd (NCH) typically concentrates in Unit 13A and portions of 13E during the calving period, spends summers exclusively in Unit 13, and in recent history migrates out of Game Management Unit 13 (GMU; Unit) in fall or early winter to overwinter in Units 11, 12, 20E, Canada, or a combination of those areas. Given the distribution of the NCH and its accessibility from the road system in summer, fall, and early winter, this herd has been used as a management experiment since the mid-1990s, as it is one of the only caribou herds through which hunter harvest may realistically be used to prevent large booms in abundance in an attempt to also prevent precipitous declines and extended periods of recovery. The goal of NCH management is to maintain the herd below the carrying capacity of the range in order to prevent damage to the range through overuse and maximize long-term sustainable yield. Informed by the abundance and harvest history of the herd, as well as range studies, the Board of Game (BOG) established population abundance objectives of 35,000–40,000 animals for the NCH in 1995, with the goal of maintaining this abundance through hunter harvest (Hicks 1996).

The Nelchina caribou management strategy has been successful, until the herd grew above objectives by 2010 and harvest was not sufficient to maintain the herd within objectives for much of the following decade. Beginning in 2016 significant efforts were made to reduce the size of the herd, which was accomplished in 2020 and 2021. By this time the herd was demonstrating signs of nutritional stress, such as declines in four-month-old calf growth metrics, declines in parturition (particularly three-year-old parturition), and increased variability of winter range. These indicators suggest that the increased size of the herd over an extended period of time may have negatively impacted the summer and/or winter range. Over the winter of 2021–22 the herd experienced deep snow across their wintering range, as well as a relatively late thaw and green-up, late migration, and late calving period. Adult mortality over that winter was unusually high, which has brought the herd well below objectives. Recruitment of calves over the winter of 2021–22 was poor. Productivity and neonate survival in the spring was poor. Preliminary indicators for the 2022/23 winter suggest another winter with very poor recruitment, resulting in small cohorts for both the 2021 and 2022 years. This loss of two cohorts will negatively impact the productivity of the herd in coming years, thus slowing the recovery potential for the herd.

Brown bear

Brown bears were recognized by the BOG in 1995 as being significant predators of moose calves and determined that the brown bear population should be reduced “until there is a consistent and statistically significant increase in moose calf survival” (95-84-BOG). The BOG also determined that the unit-wide population of brown bears should not fall below 350 bears. A resident exemption for the brown bear locking tags in Unit 13 outside of Denali State Park was implemented in 1995 and the exemption was extended to include Denali State Park in 2013. The Unit 13 brown bear bag limit was increased to one bear every year in Regulatory Year 1996 (RY; RY1996 = July 1, 1995 through June 30, 1996). In 2003 the season for brown bears in Unit 13, excluding Denali State Park, became year-round. Beginning in 2013 the harvest of brown bears at registered bait

stations was allowed in Unit 13D and in 2015 extended to all of Unit 13. Baseline density and vital rate data were collected in a portion of Unit 13 in 1998. That data collection was repeated in 2011 and in 2022 suggesting that the brown bear population has been slowly declining since 1998 under the current liberalized hunt structure (Brockman et al 2020; D. Demma, Wildlife Biologist, ADF&G, Palmer, personal communication).

Wolves

Wolves are widespread and occupy the annual range of the NCH but an active predation control program for moose in Unit 13 keeps the abundance of wolves relatively low in the calving, summer, and fall ranges of the herd.

S&I MANAGEMENT DIRECTION

MANAGEMENT GOALS

Caribou

- To provide the greatest opportunity to participate in caribou hunting.
- To provide for an optimum harvest of caribou.

The NCH has a positive customary and traditional use determination for Units 12 and 13 and the Amount Reasonably Necessary for Subsistence (ANS) is 600–1,000 caribou.

Brown Bear

The Alaska Board of Game made a negative finding for customary and traditional uses of brown bears in Unit 13.

Wolves

The Alaska Board of Game made a positive finding for customary and traditional uses for wolves in Unit 13, with an Amount Necessary for Subsistence of 8–24 wolves.

MANAGEMENT OBJECTIVES

Caribou

- Maintain a fall population of 35,000–40,000 caribou. (Codified IM objective)
- Maintain a minimum of 40 bulls:100 cows and 40 calves:100 cows.
- Provide for an annual harvest of 3,000–6,000 caribou. (Codified IM objective)

Brown Bear

- Maintain a minimum of 350 brown bears unitwide.

Wolves

- Maintain a spring (post-hunting and trapping season) minimum population of 135–165 wolves in Unit 13 (2.2–2.7 wolves/1,000 km²; 5.8–7.1 wolves/1,000 mi²).

Wolves in Unit 13 are currently managed to reduce predation on ungulate populations by maximizing public wolf harvest when wolf numbers are within or above the population objective. Wolves are recognized as an integral part of the ecosystem throughout Unit 13 and are managed also to ensure that human harvest does not eliminate the species from the management area. Human uses of wolves in Unit 13 include hunting and trapping (for personal or commercial use of hides), photography, viewing, and scientific research (ADF&G 2002).

Overall assessment of potential to increase harvest Low, Moderate, High¹: Low.

We consider the potential to increase caribou through additional wolf control in this area to be low, as a wolf control program is already active for moose in Unit 13. Brown bear populations are at relatively low densities after two decades of liberalized hunting regulations in Unit 13 and further reduction of the brown bear population is not indicated to be successful in increasing caribou harvest at this time.

Information needs:

Below we describe the limitations of the data we presently have on caribou and wolf populations, and the types of data we believe are essential before embarking on any proposed IM action. Any decision should be dependent on having baseline data on the population levels of these species, the ability to monitor these populations, and the ability to detect changes to assess the success of the program toward meeting IM objectives.

- Caribou: Because the focus of the IM program under consideration is to increase the size of the Nelchina caribou herd, our most critical information needs include the ability to accurately measure and track changes in caribou numbers. Such information will be critical to our ability to accurately evaluate the effectiveness of the program to increase caribou numbers and subsequent hunter harvest.

The size of the Nelchina caribou herd is assessed annually during post-calving aggregations, but this process is problematic as it depends heavily on the herd concentrating adequately in suitable terrain and suitable weather for an aerial survey. In some years the herd does not form strong post-calving aggregations. Minimum counts can be conducted when the herd is loosely grouped, but are not as accurate as a successful photocensus, and loose groups may also indicate that not all of the herd is in the area. Radiocollars are used to locate groups that may not be aggregating with the majority of the herd, but caribou herds are very unpredictable and despite our best efforts not all animals are adequately represented by radiocollars at all times throughout the year, or between years. Therefore accurate and precise abundance counts are not always achievable with current methods.

In addition to being able to accurately estimate caribou numbers and detect subtle changes to populations, an IM project would benefit from a better understanding of caribou mortality

¹ Component factors are discussed in Section II.

factors. Based on previous studies with this and other herds, it can generally be assumed that brown bears are more often a source of mortality early in life (neonate stage), and wolves become a more frequent source of mortality later in life for caribou. Specific mortality information has not been assessed for this herd in recent history, when bear and wolf numbers have been kept relatively low. Other than hunter harvest, the majority of adult mortality occurs on the wintering ranges outside of Unit 13 and standard check-flights performed once a month are not sufficient to identify mortality sources in most cases. Calf mortality on these wintering ranges is assessed annually through VHF collars, but sources of mortality are generally unknown for these animals as well. Assessing the mortality factors influencing the Nelchina caribou population on wintering grounds would require more frequent telemetry flights in the winter, as well as mortality reconnaissance via helicopter, but this approach on the wintering grounds may not be feasibly addressed (especially in Canada). Assessing neonate and early calf mortality would require capture of neonate caribou, collaring, and regular check-flights to assess mortality sources. Given the indications of potential nutritional stress within the herd, attempts to address neonate and early calf predation are not likely to be effective if poor nutritional condition is making neonates and calves more susceptible to all mortality sources.

Historically range studies have been conducted to assist our understanding of the Nelchina caribou calving and summer range in relation to theoretical carrying capacity for the herd. The history of herd size, in conjunction with range studies, informed the current management objectives for the herd (Pitcher 1990). The extended period of time in which the herd was above objectives, and current nutritional indices, suggest the range may have been impacted by the herd. This situation emphasizes the importance of assessing range condition to determine if the range can still sustain the herd within objectives, or if the range will need to recover in order to sustain the herd within management objectives. Evaluating dynamic and far away winter habitat is even more challenging particularly if the herd crosses international borders. Predation control is counter-indicated if the range cannot currently sustain more caribou than are currently on the landscape or if the area for predation control program is only occupied by the herd seasonally.

- *Wolves:* For a wolf predation control program it is essential that we have some understanding of wolf abundance in the proposed treatment area prior to embarking on wolf removal. Wolf numbers would have to be monitored for the life of the IM action to evaluate the ability or inability of the program to meet the specified reduction objectives. Minimum wolf numbers are currently assessed in Unit 13 annually to determine if and in which subunits wolf control should be implemented for the moose IM program.

Benefit of the above information toward the IM program: These data would benefit the IM program in at least two ways. First, the public expects action based on credible science, and these data seem essential to achieving that. Second, to determine the ability or inability of an IM program to achieve stated objectives, we need to be able to detect fine-scale changes in caribou numbers and associated changes in the predator population.

Department recommendation: It is not feasible to conduct predation control on wolves to benefit caribou in Unit 13.

I. FEASIBILITY ASSESSMENT²

A. Definitions

1. Define the relevant geographic area for assessing abundance of prey and predators (Appendix A, part 1).

Unit 13 is the geographic area used for assessing abundance of the Nelchina caribou herd during post-calving aggregations. Unit 13A and a portion of Unit 13E represent the calving area for the Nelchina herd. Units 13A and 13E would be the geographic area for assessing abundance of predators if predator control efforts were to be implemented specifically for Nelchina caribou. Nelchina wintering range varies annually and represents too large and too unpredictable an area to try to encompass for predator control activities.

2. Recommend a time period for evaluation of the proposed program that matches the regional Alaska BOG cycle:

6 years³

3. Note if the feasibility assessment is for intensive management (IM; legal requirements in Appendix A and the *Intensive Management Protocol*) or another purpose.

This feasibility assessment is for intensive management consideration.

B. Review Management Objectives and Current Abundance and Harvest

1. List the population and harvest objectives for prey species and current estimates of each; objectives may be in regulation for IM (Appendix A, part 2) or in survey and inventory reports.
 - Population objective: Objectives developed by BOG identify the Nelchina caribou herd as important for providing high levels of harvest for human consumptive use and established a population objective of 35,000–40,000 caribou with harvest objectives of 3,000–6,000 caribou. The population objective has been treated as a fall (post-hunt) population objective, and since the early 1990s the herd has been managed with the objectives of 40 calves:100 cows and 40

² The purpose of the feasibility assessment and process are described in *Intensive Management Protocol*.

³ Six years is the recommended time period for evaluating progress toward objectives because it fits a 3-year regional BOG cycle and should provide adequate time to assess whether a program is causing improvement in ungulate abundance or harvest in the defined area.

bulls:100 cows in the fall.

- Current population estimate: The 2022 fall population estimate was 17,433 caribou with 26 bulls:100 cows and 16 calves:100 cows.
- Current harvest: State and federal hunts exist for Nelchina caribou in Units 12 and 13. State harvest levels are managed through quotas and hunts are closed by emergency order when the quota is reached in order to avoid exceeding harvestable surplus. Federal harvest is largely dictated by herd movements across federal lands during open hunting seasons. For the 2022/23 season there were 518 caribou harvested by state hunters (513 bulls and 5 cows) and the winter seasons were closed by emergency order. There have been 121 caribou harvested by federal hunters (84 bulls and 37 cows) and federal hunting seasons remain open through March 31, 2023.

2. Briefly review biological rationale of IM objectives (Appendix A, part 2) or other objectives for prey species.

Population objective: The population objectives for the Nelchina caribou herd were based on an extensive review of the history of the herd and related range assessment work as the herd cycled through lows and highs (Pitcher 1990; Hicks 1996). The goal of NCH management is to maintain the herd below the carrying capacity of the range in order to prevent damage to the range through overuse and maximize long-term sustainable yield. Historically, lichen recovery and abundance decline when the herd was at or above 42,000 animals (Pitcher 1990). In recent years nutritional indices suggest that allowing the herd to remain above objectives has negatively impacted the health of the herd, supporting the biological rationale to maintain the herd below 40,000 animals.

3. List the population and harvest objectives for predator species in survey and inventory reports;
 - Wolves: Maintain a minimum spring population of 135–165 wolves in Unit 13.
 - Brown bear: Maintain a minimum of 350 brown bears in Unit 13 (95-84-BOG).

C. Recommended Management Strategy

1. Briefly describe the proposed management strategy for the ungulate population (actions to be taken on habitat, predation, harvest, access, or other factors) [*This section could include PredPrey or other population modeling to forecast response in prey during proposed treatment period under scenarios of no action (continue current situation) and under the proposed action (active management); include brief statement of modeling assumptions*].

The recommended management strategy is to minimize state harvest of caribou through quotas and/or closed seasons to allow the herd to recover and prevent harvest from exceeding harvestable surplus until the herd returns to within objectives. Harvest will then be increased to stabilize the herd and keep it within objectives. Federal hunt managers will be encouraged to prohibit harvest of cows until the herd returns to within objectives through formal consultation.

2. Propose measures of progress toward population or harvest objectives to be evaluated, identifying if additional data collection beyond survey and inventory program is necessary.
 - Herd size and composition should continue to be evaluated to measure progress toward objectives through standard survey and inventory activities unless alternative herd estimation methods are developed.
 - Harvest statistics derived from existing harvest reporting requirements will be essential for evaluating progress toward achieving harvest objectives.
3. Provide a brief explanation for collecting or evaluating data from untreated areas for comparison to areas treated under the management program as evidence in a scientific study design that the treatment effects are working as intended and not simply an artifact of no treatment effects (e.g., widespread improvement in calf survival because of mild winter across region, not because of predation control in a specific area).

The nearby Mentasta caribou and Denali caribou herds are both largely located in protected areas (National Park Service lands) and predator control is not conducted in these areas. NPS and ADF&G collaborate to conduct survey and inventory activities on the Mentasta herd, and the NPS monitors the Denali herd as well. These two herds provide opportunities to evaluate caribou population data and trajectories in nearby untreated areas.

4. Provide an estimated cost of implementation (operations and field staff salary) for the proposed program over the evaluation time period.

Continuing the current survey and inventory and harvest programs for the NCH would not necessitate additional funds.

II. POTENTIAL TO ACHIEVE UNGULATE POPULATION AND HARVEST OBJECTIVES⁴

- A. Population increases in ungulates required to reach population objective (may be represented as comparable density).
- The NCH will need to increase from the current population estimate of ~17,400 animals to the minimum objective of 35,000 animals.
- B. Increase in average estimated harvest (last three regulatory years [RY]; RY = 1 July–30 June) to reach harvest objective.
- The average annual harvest during the past 3 RYs has been 2,929 caribou, which is only 71 animals below the minimum objective (3,000–6,000 caribou), but this harvest was accomplished during a reduction and stabilization phase. After this harvest the population declined, and it is likely that less than 700 animals will be harvested during RY22. Less harvest is expected to be available for RY23.
- C. Potential to mitigate biological limitations in considered IM area (Appendix B.I).
Low/Moderate/High
- Low: Any of the following factors, functioning either independently or collectively, could influence the size and productivity of the NCH:
- Severe winter weather or stochastic weather events;
 - Reductions in carrying capacity (temporary or long-term) resulting from habitat degradation, overgrazing, or changes in vegetative community due to fire or climate change;
 - Neonate predation by eagles and others; and
 - Predation by wolves and/or black bears.
- D. Potential to reduce or moderate hunting conflicts (Appendix B.II) *Low, Moderate, High*
- Low. Nelchina caribou hunting opportunities are in high-demand by many user groups. As the herd increases in size and more opportunity becomes available, so too increases the BOG proposals from the public to limit access and/or allocate to select users. Hunting conflicts decrease as the herd decreases as there is less public interest with decreased opportunity.
- E. Anticipated public participation based on expense and other factors (Appendix B.III).
Low/ Moderate/High
- High. The public already participates in wolf predation control in Unit 13 for the moose IM program. The level of public harvest of brown bears over the past two decades has contributed to a decrease in abundance of brown bears. Nelchina caribou is a highly

⁴ The background data used in evaluating potential are found in Appendices B and C.

valued resource, and the public has great interest in protecting and improving that resource.

- F. Data availability for designing an effective management plan [Appendix C].

Low/Moderate/High

Low/Moderate. Precise population estimates are difficult and may not be attainable every year. Radiocollar efforts provide important overwinter survival data for adults and calves, which can be used to derive a population estimate when one season of summer census is unsuccessful, but after two or more years in a row of unsuccessful census attempts this data becomes less useful for deriving accurate estimates. A successful photocensus at least every other year is crucial for assessing the NCH population, but this is not always possible with caribou behavior, weather, and terrain.

We currently assess wolf populations annually in a sufficient manner to assess numbers in relation to objectives and determine if or in which subunit to activate wolf control each winter per the current IM program for moose.

- G. Potential to measure or demonstrate progress in ungulate population recovery or an increase harvest within a defined time period (Appendices B.I.E. and Appendix C).

Low/Moderate/High

Moderate. Survey and inventory activities as well as harvest reporting should be sufficient to demonstrate changes in either population or harvest within the 6-year evaluation time period.

- H. Potential to document reasons for success or failure in population recovery or harvest increase (Appendix B.I.E). Low/Moderate/High

Low/Moderate. Data will not be sufficient to directly identify specific causes of success or failure in population recovery within this complex ecosystem, but data will be available to make reasonable deductions regarding the positive or negative influence of factors such as harvest level, snow depths, spring/summer range status, and relative predator abundance within spring/summer/fall range.

APPENDIX A. Legal elements and criteria for intensive management objectives and a feasibility assessment.

Department staff should review and ensure the following four elements have been met [*Brief listing of information by bullet may be useful for Sections 1, 2, and 3 this appendix*]:

1. Definition of populations:

- The relevant area for defining an ungulate population under intensive management (IM) is that defined as a positive determination in Title 5, Alaska Administrative Code, Chapter 92, Section 108 (5 AAC 92.108).

The Unit 13 portion of the Nelchina herd's range.

- “Game population” is defined in AS 16.05.940(20) as a “group of game animals of a single species or subgroup manageable as a unit.” Clarify the purpose of ungulate or predator management zones proposed to be smaller than areas under 5 AAC 92.108.

The Nelchina Caribou herd ranges across many GMUs and in some years into Canada. The Nelchina herd size is assessed in Unit 13, as that is the area in which post-calving aggregations and census attempts occur, and the vast majority of hunting opportunity and harvest occurs in Unit 13 as well. Abundance objectives are considered fall population objectives; fall population estimates are derived by taking fall harvest and fall composition surveys into account in combination with post-calving census and composition data to determine a post-fall hunt abundance estimate, using hunter harvest to maintain the herd within fall objectives.

- Consider whether a population with a positive determination for IM (5 AAC 92.108) should match or differ from amounts necessary for subsistence (5 AAC 99.025) for the same geographic area.

The amount necessary for subsistence (ANS) for Nelchina caribou is 600–1,000 caribou across Units 12 and 13 (some federal harvest does occur in Unit 12 during the winter). Herd IM determination and abundance estimates are appropriately based on Unit 13 estimates, and ANS appropriately includes subsistence uses across a larger geographic area because the herd often migrates out of Unit 13 during winter.

2. The BOG has established population and harvest objectives for IM of identified ungulate populations for a high level of harvest by humans:

- Positive determination made for the NCH per 5 AAC 92.106(1) by considering the following factors:
 - Historic NCH harvest exceeds defined levels (caribou: 100,); the highest three consecutive years and three most recent years are.
 - Highest 3 years: RY 2015–2017 = average 5,128/yr
 - Most recent 3 years: RY 2019–2021 = average 2,929/yr

- Accessibility (roads, rivers, trails, landing strips).
The majority of NCH harvest occurs in Unit 13, which is highly accessible using either highway vehicles, boats, ATV's, snow machines, float planes, or a combination of these means of transportation.
- Use of harvest primarily for meat.
Caribou harvest is primarily for meat.
- Hunter demand (reported hunting effort, number of applicants for permits).
During the recent peak in Nelchina abundance and corresponding harvest opportunity there were more than 9,000 subsistence permit applications annually (RY2016–2018) and more than 38,000 applications for draw permits for RY2018.
- Population and harvest objectives established in 5 AAC 92.108 based on these criteria in 5 AAC 92.106(2):
 - Effects of weather, habitat capability, diseases, and parasites.
 - Weather: Severe winter weather can have negative effects on adult and calf survival, which is exacerbated when the herd or portions of the herd are experiencing nutritional stress.
 - Habitat capability: The current management objectives of 35,000–40,000 caribou for fall herd abundance were established to maintain the herd below carrying capacity and maximize long-term sustainable harvest opportunity. An extended period with the herd above objectives may have decreased the capacity of the range to maintain this herd size, at least temporarily. It is unknown whether other factors such as habitat degradation through human use of the landscape, potential changes in climatic patterns, and/or changes in the vegetative communities across the landscape may increase or decrease the capability of the range to sustain the herd long-term at the level of current objectives.
 - There is no evidence that disease or parasites are contributing to the decline in the NCH.
 - Maintenance of viable predator populations (see definition in *Intensive Management Protocol*).
 - Wolf predation control efforts in Unit 13 have demonstrated the ability of permitted pilots to effectively reduce the abundance of wolves across the landscape, as well as the ability of the wolf population to recover in abundance after only 2–4 years of suspending control efforts.
 - Brown bear densities have been on a gradual decline over the past two decades of liberalized hunting regulations and evidence suggests that the current level of harvest pressure will maintain low densities and/or contribute to further decline.

- Maintenance of habitat conditions suitable for other species in the area:
Maintaining NCH within established population objectives should not negatively impact habitat conditions for other species in the area.
 - Effects on subsistence users:
Subsistence users will be negatively affected if NCH numbers remain below objectives. Population objectives for NCH were established to provide for long-term sustainable subsistence opportunities.
 - Cost, feasibility, and potential effectiveness of possible management actions.
 - *Cost:* Continuing the current harvest and survey/inventory strategies will not pose additional costs.
 - *Feasibility and effectiveness of management actions:* Reducing state harvest under the current management framework is feasible and has been shown in the past to be effective in providing the NCH opportunity to rebound in numbers over time. It is important to limit/eliminate cow harvest to protect the reproductive potential of the herd, and cow harvest under federal hunting regulations will contribute to an extended recovery time.
 - *Landownership patterns within the range of the population:* Land ownership across the entire range of the population consists of mostly state and federal lands, with Native Corporation and private lands included, as well as Canadian lands in the wintering range.
 - Accessibility to harvest.
When the NCH is in Unit 13 it is highly accessible for harvest via highways, extensive trail systems, and major lake and river systems.
3. Depletion of the ungulate population (abundance or harvest below objectives) or reduction of the “productivity” (recruitment) of the population has occurred and may result in a “significant” reduction in the allowable harvest per Alaska Statute, Title 16, and Chapter 5 (AS 16.05.255 [e]).

Yes, NCH numbers are well below objectives at this time. If census efforts in summer 2023 confirm abundance is again below objectives there may be very little or no harvestable surplus in coming seasons.

4. Enhancement of abundance or productivity of the big game prey population is feasibly achievable utilizing recognized and prudent management techniques (AS 16.05.255[e][3]).

Management of predators beyond existing programs to enhance abundance or productivity of the NCH is not expected to be feasible at this time. Limiting harvest is the feasible approach for herd recovery at this time.

5. The BOG is not required to adopt regulations to provide for an IM program per AS 16.05.255(f)(1) if a proposed IM program is:
- Ineffective based on scientific information:
Other than manipulating harvest levels, IM action is not likely to be effective for improving the NCH based on the scientific information currently available.
 - Inappropriate due to landownership pattern:
The landownership pattern in Unit 13 is appropriate for IM actions, but the landownership pattern across the entire range of the NCH is not, given the federal and international lands involved.
 - Against the best interest of subsistence uses:
Subsistence users will benefit from an increase in the NCH.
6. The BOG may forego a feasibility assessment if per AS 16.05.255(f)(2) it declares that a biological emergency exists and takes immediate action to protect or maintain the big game prey population in conjunction with the scheduling for adoption of those regulations that are necessary to implement section (e).

APPENDIX B. Elements of a feasibility assessment for an area (deer, moose) or herd (caribou).**I. BIOLOGICAL FACTORS**

Biological factors are the basis for evaluating potential to achieve population or harvest objectives. Information may be yes/no, numeric, categorical, or not applicable depending on species or area. Brief explanations may be warranted along with local data where available. In most instances professional judgment by department staff will be required to put numbers in context in the recommended management strategy (Section I: Feasibility Assessment, p. 1).

A. Nonpredation and Nonhunting Mortality of Prey.

1. How frequently is there markedly reduced survival due to annual weather (snow depth, especially associated with complicating factors, such as severe cold; ice on snow events; flooding; drought)? *[Expected primarily to affect young, but not exclusively. General examples of thresholds include snow ≥ 36 inches deep for moose or ≥ 20 inches for deer, or prolonged wind chill $< 0^{\circ}\text{F}$ for deer in shrub-dominated coastal areas. Other empirical values may pertain in specific areas.]*

Markedly reduced survival of adults in relation to severe winter weather and stochastic weather events is rare, but one recent occurrence did result in current abundance levels being below objective. Markedly reduced overwinter survival of calves due to weather is more frequent than for adults, but in the history of the herd still rare. For both age classes, markedly reduced survival associated with adverse weather is more likely to occur when animals are nutritionally stressed.

2. How extensive is vehicle mortality along road and rail systems that reduce harvestable surplus in the population (estimated number killed annually or as a percentage of total kill by humans that includes harvest and defense of life or property)?

The majority of vehicle mortality occurs along the Richardson Highway and Tok Cutoff during herd migration, and to some extent likely the Alaska Highway in some years as well. Data is not available on total number of vehicle mortalities annually, but our knowledge of vehicle mortalities suggests this represents less than 5% of human-caused mortality annually.

B. Productivity of Prey Population and Habitat (may include prey density effects)

1. Evidence of inherent habitat limitation (e.g., nutrient deficiency) manifested in low reproduction, body weight, or survival? *Yes/No* *[There are examples of areas with low predation and high density that still exhibit an ability to increase, such as moose in GMUs 20A, 20B, and 20D; the Stikine River Valley; and on Kalgin Island. Low birth rate in itself does not mean the population can't increase. However, it is a first cut to understanding relative system productivity. Predation control applied to a system with low productivity may allow some increase in abundance, such as with*

Nelchina caribou, or reallocation of mortality from predators to harvest. It provides a context for what to expect in a response to a management treatment.]

The herd has recently demonstrated signs of nutritional stress, such as declines in four-month-old calf growth metrics, declines in parturition (particularly three-year-old parturition), and increased variability of winter range use. These indicators suggest that the increased size of the herd over an extended period of time may have negatively impacted the summer and/or winter range. Unusually low survival for some calf cohorts over the past few years as well as for adults and calves in 2021–22 is additional evidence that the herd has been experiencing nutritional constraint.

2. How strong a negative effect from the local prevalence of diseases or parasites?

Low/Moderate/High

Low - there is no evidence that disease or parasites play a role in limiting the caribou population in this area.

3. Evidence of longer-term weather trend changing forage production or other habitat requirements (e.g., markedly increased area in recent burns or noticeably less frequent flooding) and its consequence for the ungulate in question Yes/No. Note trend in habitat capability. Positive/Negative

At this time there is no evidence that climate change will result in lower caribou numbers in this area.

4. Evidence of high or excessive levels of forage use (excessive means evidence of plant mortality from inability to rejuvenate after persistent grazing or browsing at some proportional level of biomass removal). Yes/No

Data is not available on the current status of the range, but range sampling efforts and evaluation projects are being initiated in spring, summer, and fall range.

5. Has the combination of natural and human-caused disturbance produced an extent and mixture of vegetative seral stages capable of maintaining the present productivity if the population changes due to management treatment at a moderate level of increase? Yes/No. At a substantial level of increase? Yes/No

No - neither natural nor anthropogenic disturbance have created improvements to caribou habitat on the range, and disturbance is more often considered negative for caribou habitat.

- C. *Potential Effectiveness of Proposed Predator Control* (based on number of predator species and seasonal prey location).

1. Is effect of predation by individual predator species known for the ungulate species of interest in the proposed area? Yes/No [*by predator species*]
No. Since wolves and brown bears have declined in abundance through human harvest in recent years, no specific mortality studies have been conducted for caribou in Unit 13.
 2. Is predation control being proposed for one or multiple predator species? One/Multiple [*list predator species*]
None.
 3. Are there concentrated calving and/or young rearing areas of ungulates for focused bear or wolf control? Yes/No [*define which predator(s)*]
Yes. Unit 13A and a portion of Unit 13E contain those areas.
 4. Are there concentrated winter ranges of ungulates suitable for focused wolf control?
Yes/No/Unknown
No. Winter range varies annually in an unpredictable fashion.
- D. *Potential Effectiveness of Public Participation in Predator Control (under permit) or Predator Harvest* (see also III.A and III.B this appendix)
1. Number of licensed hunters and trappers within or near proposed management area (size of potential participant group) and the proportion of these hunters and trappers actively harvesting predators.
Over the last 3 years wolves have been harvested in Unit 13 by 86 hunters and trappers, not including additional wolves taken through permitted wolf control efforts.
 2. Estimated wolf harvest rate (percentage of estimated fall population, average of three most recent regulatory years).
Over the most recent 3 regulatory years wolf harvest averaged 31% of the fall population estimate.
 3. Estimated black bear harvest rate (percentage of estimated spring population, average of three most recent regulatory years).
Data is not available to estimate black bear harvest rate in Unit 13.
 4. Estimated grizzly/brown bear harvest rate (percentage of estimated spring population, average of three most recent regulatory years).
Data on brown bear densities and harvest levels in Unit 13 indicate that brown bears are being harvested at a rate in excess of 8.4% (Brockman *et al.* 2020). Preliminary

results from density data derived in 2022 support the assumption that the rate of harvest has increased as the population has declined.

5. Historical effectiveness of a predator control program in this area (where applicable).

Wolves are currently under an active predation control program to benefit moose in Unit 13. This program coincides with a positive trend in moose numbers in all treated subunits, reaching carrying capacity in those areas. Caribou likely benefited from these wolf control efforts.

6. Number of competing predator control programs in the region and the anticipated impact of adding an additional program (potential dilution of participation by skilled members of the public).

There is currently an active Intensive Management program for moose in Unit 13, which includes a wolf predation control program. Moose and wolf abundance is considered when activating or suspending wolf control activities in each subunit for each given year, but caribou calving grounds and potential impacts of wolf predation control on caribou productivity and survival are also considered. An additional wolf predation control program for caribou in Unit 13 is not likely to be more effective for caribou than the current program.

E. *Ability to Confirm Treatment Response (Yes/No answers):*

1. Established periodic survey for abundance.

The size of the Nelchina caribou herd is assessed annually during post-calving aggregations, but this process is problematic as it depends heavily on the herd concentrating adequately in suitable terrain and suitable weather for an aerial survey. In some years the herd does not form strong post-calving aggregations. Minimum counts can be conducted when the herd is loosely grouped, but are not as accurate as a successful photocensus, and loose groups may also indicate that not all of the herd is in the area. Radiocollars are used to locate groups that may not be aggregating with the majority of the herd, but caribou herds are very unpredictable and despite our best efforts not all animals are adequately represented by radiocollars at all times throughout the year. Therefore accurate and precise abundance counts are not always achievable with current methods.

2. Fall composition surveys for young to adult female ratio as index to survival.

Fall composition surveys are conducted annually and compared to summer composition surveys to determine changes in calf:100 cow ratio.

3. Fall composition surveys for yearling to adult female ratio as index to survival.

No – fall composition surveys for yearling to adult female ratio are not feasible due to difficulty in identifying yearlings during composition surveys.

4. Radiotelemetry for survival of specific age cohorts.

Completed annually.

5. Total prey harvest and age-sex composition of harvest among local residents, state residents, and nonresidents (where applicable).

Yes – reporting is required for all caribou permits.

6. Harvest per unit effort, particularly in focused program areas where the initial intent is reallocation of mortality from predators to harvest to first meet local harvest needs.

Yes – effort is included in reporting requirements.

II. SOCIETAL FACTORS

Societal factors associated with hunting conflicts (e.g., constraints to access, acceptable methods, and harvest expectations), hunter access, and public tolerance for intensive management practices.

A. *Public expectation for predator control and increased ungulate harvest must be understood prior to initiating programs to increase ungulate populations. Public conflicts over ungulate harvest methods can reduce options for controlling population growth. Failure to limit growth can reduce the condition of habitat and ungulates to the extent of reduced productivity. Critical components of conflict mitigation are identifying acceptable predation control methods as well as the potential for additional ungulate harvest opportunities that are acceptable to the hunting and nonhunting public. Defining the benefits of increased harvest is complex because hunter motivation may include economic factors (cost of meat replacement) and intangible measures of satisfaction (continuation of hunting culture, time spent in the field with family or friends, etc.).*

1. Has the public defined an acceptable quantity and sex/age structure of ungulate harvest? Yes/No

The BOG determined ANS for the NCH to be 600–1,000 caribou and IM harvest objectives to be 3,000–6,000 caribou. The NCH has been managed since the early 1990s with objectives of 40 bulls:100 cows and 40 calves:100 cows in the fall and the BOG has not directed the Department to alter those management objectives.

2. Does the level of unreported or unknown harvest hinder the ability of the department to evaluate response to management treatments? Yes/No

No. Unreported harvest is believed to be relatively low for this herd, where public presence and scrutiny of other hunters is high in the field. Unknown harvest in Canada is believed to be minimal at this time. Wounding loss when the herd is migrating across the Richardson highway is believed to be a larger concern than either unreported or unknown harvest, but not sufficient to hinder overall recovery of the herd in the long term.

3. Has the department informed constituents about ecological and biological constraints (nutrition, forage condition) relative to setting upper limits for population densities of managed ungulates? Yes/No

Yes – this message is conveyed regularly at AC meetings and outreach events. Multiple online lectures have been given to explain NCH management and the strategy to maintain the herd below carrying capacity. These lectures are still available online, including one on the ADF&G YouTube channel.

4. If possible, from historic data, characterize hunter density where significant conflicts occur between hunters: Low, Moderate, High and between hunters and nonhunters: Low, Moderate, High

High and Low. The accessibility of vast public lands in Unit 13 makes it a popular hunting destination for NCH hunters and moose hunters during the fall hunting season. The Denali Highway, the Richardson Highway, and the Eureka area are three areas in particular where hunters complain of crowding, competition, and concerns for public safety with high densities of hunters on the landscape. During times when the NCH is abundant and harvest opportunities are expanded there is typically an increase in public proposals to the BOG to limit and/or allocate opportunity among user groups in efforts to decrease competition. Complaints between hunters and nonhunters are not typically a concern that the Department is aware of, except for hunters conflicting with nonhunting traffic on the Richardson Highway when caribou are crossing the highway.

5. If possible, from historic data, what is potential for conflict in rural areas between local hunters and nonlocal hunters? Low, Moderate, High

High – see above.

6. Conflicts or problems associated with access, such as existing access constraints. Few, Some, Many

Some. Trail systems are extensive but have limited entry points from the road system. Many hunters choose to hunt along roads with highway vehicles, and crowding and conflict is frequent when caribou are accessible in these areas. Fly-in hunting has greatly diminished as trail systems have expanded and lakes throughout the unit have become accessible via land.

7. Acceptable strategies to spread out hunters and minimize trespass on private lands.
Few, Some, Many
Some – separating hunters spatially and/or temporally via permit conditions has been successful in spreading out hunters in some cases. Private landowners post their lands, and the local Native Corporation has developed a free land status app for the area, which has aided hunters in avoiding private lands.
8. Acceptable strategies to minimize unacceptable levels of trail damage on public lands. Few, Some, Many
Few – the Tangle Lakes Archaeological District is the only area in Unit 13 that restricts motorized users to existing trails. Outside of that area public use of the trails has resulted in drastic expansion of the backcountry trail system throughout Unit 13 over the past two decades. Trail planning/building/maintenance is almost nonexistent in Unit 13 and as such the “social trails” that contribute to trail expansion may result in extensive mud-pits and/or spiderwebbing in vulnerable habitat areas (perpetually wet areas, for example).
9. Acceptance of restricted methods or means for *harvest, particularly near communities* (e.g., archery or muzzleloader). Yes/No
No – hunting pressure is not typically concentrated near communities.
10. Anticipated increase in vehicle mortality with ungulate population growth (poses a public safety risk). Low, Moderate, High
Low – vehicle mortality will fluctuate as the size of the NCH fluctuates, but it is not expected to increase significantly from what has occurred in recent years, during the peak in abundance.
11. Anticipation of strongly adverse public reaction to a management tool (e.g., predation control, prescribed fire, selective harvest), geographic area, or other facet of the proposed program. Low, Moderate, High
Moderate – intensive management actions are generally accepted in Unit 13, although cow harvest to control ungulate populations and increase harvest opportunity once ungulate populations rebound are much more controversial, accepted by some and not others.
12. Potential for predator control to have indirect negative effects on alternate prey, such as increase in medium predators that can prey on ungulate young, particularly in species of high interest to hunters (e.g., increased coyote abundance following extended periods of wolf control to benefit moose or caribou could increase predation on Dall sheep lambs during peak abundance of hares, with implications on number of legal rams in future years). Low, Moderate, High

Moderate – anecdotally, coyote sightings have expanded and increased across the landscape of Unit 13 and neighboring Unit 11. Dall sheep populations have declined in recent years, largely due to weather events, but higher densities of coyotes have the potential to impact recovery of these populations. With declines in brown bear populations there have also been black bears sighted in areas they were not previously seen, which were considered brown bear habitat more than black bear habitat (correlation not necessarily causation). Expanding black bear populations could negate some of the intended benefit of reducing brown bear populations, as black bears also prey upon neonate moose.

13. Coordination among hunters and trappers about control methods and allocation among ground-based trappers, aerial gunners by permit, and department *use of helicopters*. Low, Moderate, High

Moderate – conflicts between user groups exist with current wolf control activities.

- B. *Landownership* may influence or restrict access for predator control or ungulate harvest. Proximity of restrictive status to communities or areas where management treatments would be most effective is the important context (see discussion of management strategy, Section I: Feasibility Assessment, p. 1). If the objective is to increase harvest in a local area as progress toward a larger area objective, a program to reallocate mortality from predation to harvest without a substantial increase in ungulate abundance may be feasible with harvest coordination (see Section III.A.3).

1. Percentage of national park or preserve and national wildlife refuge (where predator control may be restricted) in game management unit or subunit or caribou herd range.

6.18% of Unit 13 is National Park or Preserve.

Low prevalence of federal lands has not limited the success of wolf control in Unit 13.

2. Percentage of area in federally designated wilderness or wilderness study areas where habitat or wildlife management may be subject to more extensive public process.

There are no wilderness designated lands in Unit 13.

3. Percentage of Alaska Native corporation land.

Alaska Native corporation land accounts for 7.43 percent of Unit 13.

4. Access for predator control or ungulate hunting allowed on Alaska Native corporation lands? Yes/No

Yes.

C. *Access for Predator Reduction and Ungulate Harvest* (see also Sections II.A.6 and II.A.7)

1. What is the extent of all-season roads? Limited/Moderate/Extensive

Moderate – the Parks Highway, Glenn Highway, Richardson Highway, and Tok Cutoff provide year-round access while the Denali Highway provides seasonal access for highway vehicles and is groomed for snowmachines during much of the winter.

2. What is the extent of ATV trails? Limited/Moderate/Extensive

Extensive – the full extent of the ATV trail system is unknown but there are more than 2,000 miles of trails in Unit 13.

3. What is the extent of navigable rivers? Limited/Moderate/Extensive

Extensive – large river and lake systems providing access to Unit 13 include the Nenana river, the Susitna river, the Chulitna river, the Maclaren river, the Delta River, Tangle Lakes, Paxson Lake, the Gulkana River, Lake Louise, Lake Susitna, Tazlina Lake, the Nelchina river, the Little Nelchina River, the Tazlina river, the Klutina river, Klutina Lake, the Gakona river, the Copper river, the Chistochina river, among others.

4. What is the feasibility of landing fixed-wing aircraft in winter for predator removal?

High.

5. What is the feasibility of landing fixed-wing aircraft in fall for ungulate hunting?

Moderate. Aircraft are used for hunting but less in recent years as the ATV trail system has expanded.

6. What is the feasibility of ocean shoreline access for hunting or predator removal?

Not applicable.

7. Is use of helicopters by the public (under permit) allowed for trapping or retrieval of carcasses from aerial shooting?

No.

8. Are there controlled use areas that prohibit aircraft access for ungulate harvest?

Yes, although these areas represent a relatively small portion of the Unit.

III. ECONOMIC FACTORS

Economic factors define estimated costs of management programs and expectations for public participation in predator control programs for comparison to perceived benefits by the BOG and the public.

A. *Cost of Participation* (in prey harvest or predation control by the public)

1. Price (dollars/gallon) of unleaded gasoline (average among communities).
Cost of unleaded gasoline currently in Glennallen is \$4.49 per gallon.
2. Price (dollars/gallon) of 100 octane low lead aviation fuel (average among communities).
Cost of 100 octane low lead aviation fuel in Glennallen is currently \$9.50 per gallon.
3. Cost to hunters per prey animal harvested from alternative area (e.g., transportation cost to hunt in adjacent areas with harvestable surplus of ungulates).
Low/Moderate/High
Difficult to quantify; moose remain available in Unit 13 but displaced NCH hunters seeking caribou are likely to travel to Fortymile country, which may be an extra 200 miles or more for some hunters.
4. Value of predator hides or other parts legal to sell.
Low. Green wolf hides = \$200 ea. Tanned wolf hides = \$500–700 ea.

B. *Potential for Participation* (in predator control or harvest by public)

1. Would creating a new predation control program hinder ability to maintain public involvement in existing predation control programs in the region?
No.
2. Will a predation control program, habitat enhancement project, or ungulate harvest strategy conflict with existing harvest of predators by reducing opportunity for local hunters or trappers?
No.
3. Potential to conduct department-sponsored control programs if public participation is lower than expected. Low
Low.

C. *Potential for Cost Sharing* (in habitat enhancement) (see also Section II.B)

- Low.
1. Potential to collaborate on prescribed fire where hazardous fuel reduction is the primary goal. Low/Moderate/High
Low.
 2. Potential to collaborate on forest management or mechanical vegetation treatments to produce wood products or reduce hazardous fuels. Low/Moderate/High
Not Applicable.

APPENDIX C. Availability of population and harvest information.

Data include status of predators, ungulate species, and habitat for modeling predator removal rates and time until increase in harvest of ungulates is feasible [*Yes/No/Unknown/Not applicable*]

- Ungulate population status:
 - Abundance survey within last 2 years. Yes, minimum count.
 - Abundance surveys on set schedule to estimate trend. Yes.
 - Composition survey within last 2 years. Yes.
 - Estimate of parturition rate within last 5 years. Yes.
 - Young survival estimate with mortality causes identified. Yes – survival estimate, no mortality causes.
- Harvest of prey:
 - Trends in reported harvest by residents and “local” (game management unit) residents among general season, drawing permit, registration permit, and Tier II categories over last 10 years.

Table 1. Unit 13 Nelchina caribou Tier I subsistence permits and harvest, RY14–23.

Year	CC001			RC561/RC562/RC566		
	Permits	Hunted	Harvest	Permits	Hunted	Harvest
2014	569	266	144	5,595	3,876	2,268
2015	659	330	191	7,235	4,817	2,911
2016	1,214	636	370	8,470	5,738	3,518
2017	1,004	484	262	8,444	5,219	2,733
2018 ¹	838	382	168	8,767	3,877	1,060
2019	811	406	256	5,674	3,540	2,172
2020 ¹	818	476	294	6,891	4,473	2,514
2021 ¹	909	381	178	7,100	2,673	977
2022 ¹	827	312	68	5,288	2,143	366
2023	793	TBD	TBD	3,042	TBD	TBD

¹ In these years state seasons were closed by EO when quotas were met for each hunt.

Table 2. Units 12 and 13 Nelchina caribou federal subsistence permits and harvest, RY14–23

Year	FC1302			FC1202		
	Permits	Hunted	Harvest	Permits	Hunted	Harvest
2014	2,953	1,397	237	116	59	37
2015	3,083	1,564	595	126	75	49
2016	3,154	1,533	491	114	47	6
2017	3,071	1,526	358	128	36	10
2018	3,082	1,433	370	88	43	13
2019	2,787	900	102	158	96	55
2020	2,916	1,195	306	149	79	59
2021	2,606	945	220	130	61	28
2022	2,264 ¹	TBD	119 ¹	87 ¹	TBD	8 ¹
2023	TBD	TBD	TBD	TBD	TBD	TBD

¹ Federal hunt is ongoing and federal permits may still be issued for 2022.

Table 3. Unit 13 Nelchina caribou state drawing permits and harvest, RY14–23.

Year	Resident Draw				Nonresident Draw			
	DC480–483/DC485/YC495				DC475			
	Applied ¹	Permits	Hunted	Harvest	Applied ¹	Permits	Hunted	Harvest
2014	19,959	1,000	576	299	Not in Regulation			
2015	22,478	1,001	588	296				
2016	13,106	4,999	3,354	1,898				
2017	30,655	4,998	3,055	1,534				
2018 ²	38,611	5,000	1,219	260				
2019	29,068	599	408	285	-	-	-	-
2020 ²	46,813	2,200	1,475	931	3,002	50	26	12
2021 ²	53,254	2,200	796	328	3,300	50	35	18
2022 ²	44,270	699	367	84	-	-	-	-
2023	-	-	-	-	-	-	-	-

Note: En dash denotes that no permits were offered.

¹ Beginning in 2017 it was possible for one individual to submit up to 6 applications for one hunt.² In these years state seasons were closed by emergency order when quotas were met for each hunt.

- Where unreported harvest occurs, public perception of trend.
Public perception is that this occurrence is low and there is no trend.

- Estimate of unreported harvest from telemetry, Division of Subsistence, or other sources.

The department estimates very low occurrence.

- Department estimate of current sustainable harvest (*Amount necessary for subsistence.*)
For RY22 the Department estimated 1,050 animals as harvestable surplus for the NCH, as there were excess bulls available in the herd that season. Preliminary data based on fall composition ratios, fall population estimate, and calf recruitment data for the 2022–23 winter suggest that there may not be harvestable surplus available for the RY23 season if the 2023 summer census effort results in an abundance estimate below objectives.

The BOG in 2009 established ANS for the NCH to be 600–1,000 animals. In 2011 the BOG reaffirmed that this ANS was appropriate given the history of both local and nonlocal subsistence uses of the herd (11-184-BOG).

- Historical harvest by nonresidents? A nonresident hunt was established in regulation in 2018 and this hunt has only ever been offered in RY20 and RY21 (Table 3).
- Present harvest by nonresidents? None.

- Status and harvest of predators:

- Survey/census of wolf density within last 5 years. No, however minimum counts are completed.
- Survey/census black bear density within last 5 years. No.
- Survey/census grizzly/brown bear density within last 5 years. Yes.
- Predator-prey ratio estimated. No.
- Survey of alternative prey adequate to aid predator recovery. Yes.
- Most wolf harvest accounted for by sealing data. Yes.
- Most black bear harvest accounted for by sealing data. No.
- Department estimate of black bear harvest where sealing does not occur. Harvest reporting is provided through harvest tickets.
- Most grizzly/brown bear harvest accounted for by sealing data. Yes.

- Habitat condition (methods may be specific to region or species):

- Proportional removal of browse biomass in previous 5 years with no large population change or widespread disturbance (e.g., fire) since browse survey. N/A.
- Proportion of browse species with broomed growth structure (history of browsing). N/A.

- Proportion of area burned in last 10 years (potential browse availability). N/A.
- Proportion of area in appropriate habitat type based on vegetative classification (define as forage, cover, etc.). Unit 13 contains a substantial portion of caribou habitat, leading the herd to spend calving, summer, and fall seasons in Unit 13.
- Ungulate nutritional condition (representative of environmental conditions experienced during the most recent population census or estimate; may be specific to area/region or herd) [*options currently being discussed*]:
 - Percentage of productive 3-year-old female caribou (cohorts are radiomarked for calf weights and monitored for photocensus coverage). The most recent 5yr weighted average has dropped to 9%.
 - Weight of 4- or 10-month-old females (*caribou, deer, moose*). The most recent 3yr average for 4-month-old female calves is 116.3lbs.
 - Weight of adult (5–6-year-old) female caribou (herd specific; requires baseline). Not available.
 - Yearling female mandible length. Most recent 3yr avg: 20.9cm.
 - Ratio of femur to hind foot length. Not available.
 - Two estimates of moose twinning rate in previous 5 years with no large population change. Not applicable.

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Figures

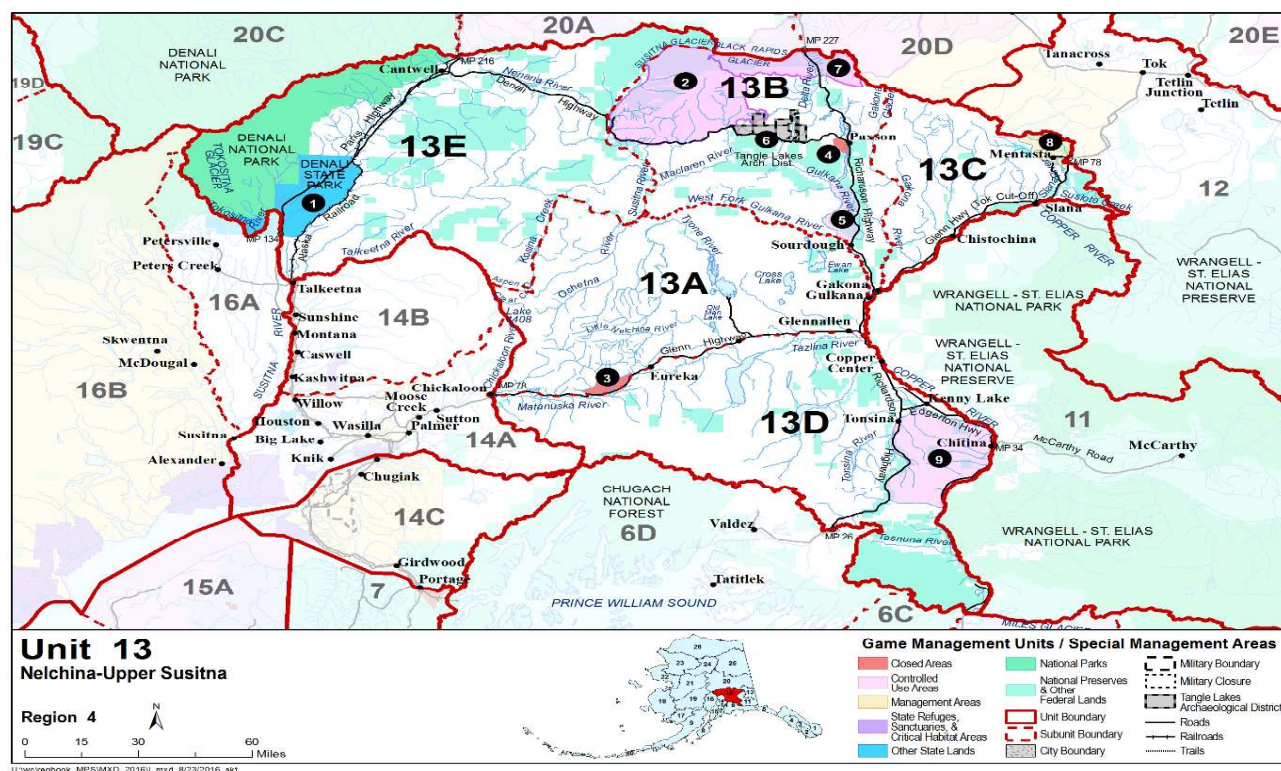


Figure 1. Game Management Unit 13 area of 23,368 square miles in central Alaska.