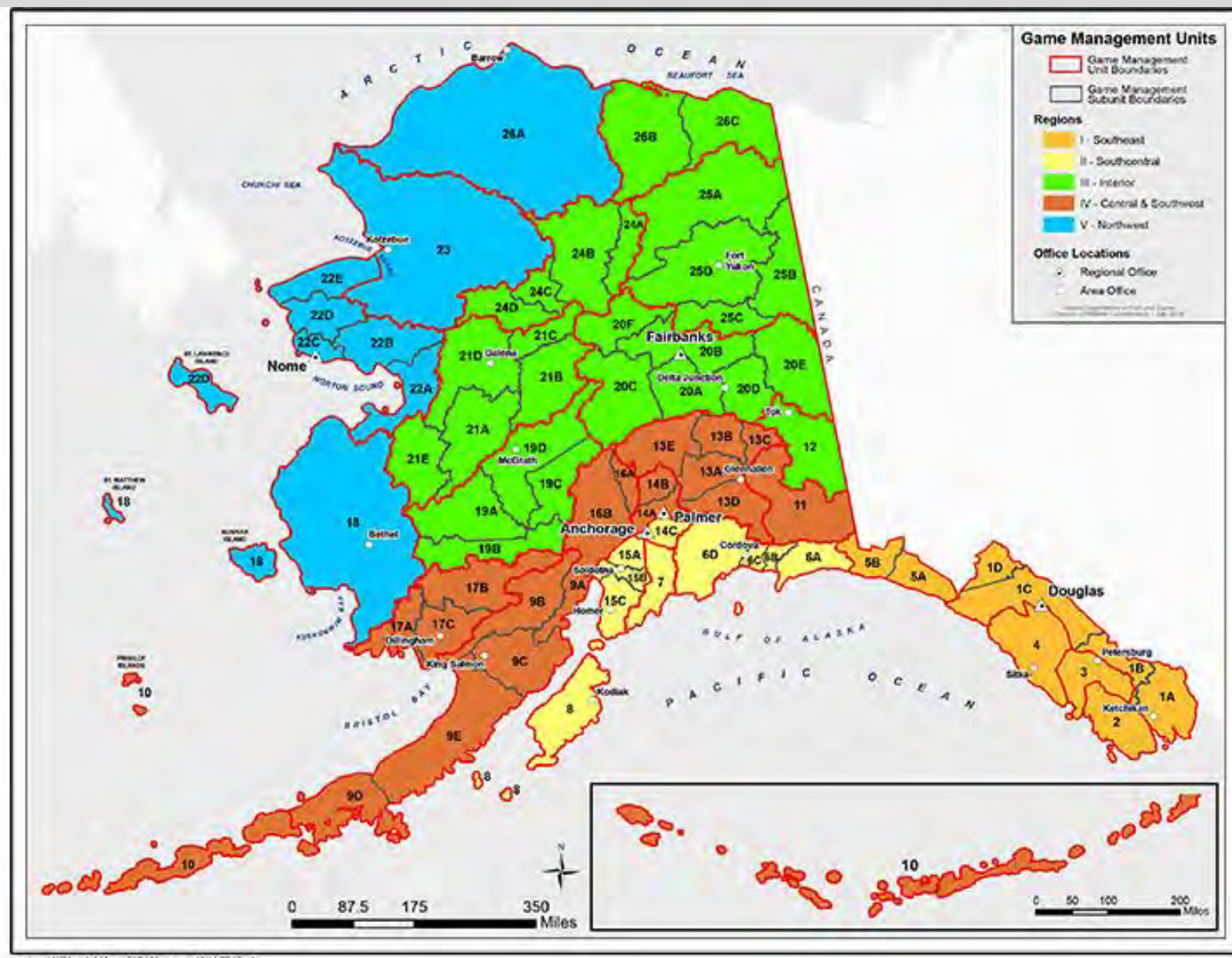


An Overview of Alaska Department of Fish and Game Wildlife Research in Region IV

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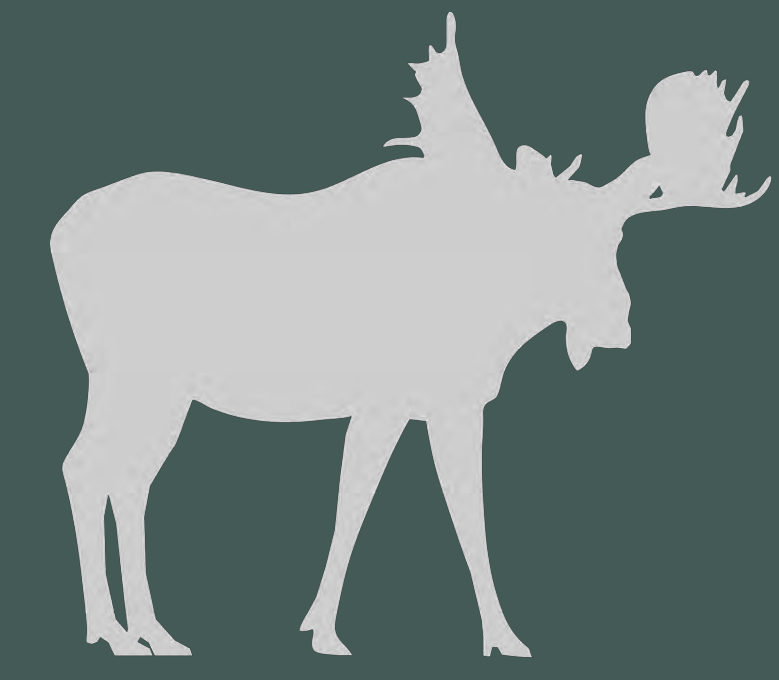
- Alaska Department of Fish and Game's mission is to protect, maintain, and improve the fish, game, and aquatic plant resources of the state, and manage their use and development in the best interest of the economy and the well-being of the people of the state, consistent with the sustained yield principle.
- ADFG Region IV spans the full width of central Alaska, from the tip of the Aleutian islands to the Yukon border, encompassing over 327,000 km² of lands managed for a diverse array of objectives by an equally diverse group of agencies.
- Research biologists in Region IV work across this vast landscape, often in conjunction with State, Federal, Native, NGO, and academic partners, to address numerous informational needs to inform management decision making.
- Below, we provide brief summaries of just some of the ongoing research by Region IV biologists to broaden awareness of how our work not only informs management of wildlife populations but advances the field of wildlife ecology.

- Project:** Wolf Abundance and Demography in Unit 17 (Nick Demma, PI). 03/2018-7/2021
- Purpose:** to evaluate the effectiveness of the Mulchatna caribou herd (MCH) intensive management program for reducing wolf density in the Mulchatna Wolf Control Area (WCA)
- Objectives:**
 - Determine annual abundance of wolves in the wolf control area.
 - Document annual productivity, survival, and dispersal.
- Status:** We deployed GPS collars on wolves in 2017-2019 (n=33) in/adjacent to the Board of Game designated WCA. Collar deployment will continue until 2021. From these data, we plan to assess seasonal variation in diet, age at first reproduction, den site selection, and changes in pack size and space-use. This information will help us to evaluate the efficacy of predation control for this caribou population. We are currently considering adding genetic sampling components to this study to evaluate their effectiveness relative to GPS collars.



- Project Name:** Demography and sources of mortality in GMU 17 moose (Kassie Colson, PI). 3/2018 – 11/2022
- Purpose:** to determine the cause of a probable population decline in order to improve the management of this resource
- Objectives:**
 - Document reproductive and nutrition related metrics for Unit 17 moose.
 - Determine survivorship of calf, yearling, two-year-old, and adult moose, as well as likely sources of mortality.
 - Investigate the spatial and temporal pattern in mortality amongst calf and adult moose, and how this relates to landscape predation risk.
- Status:** During spring of 2018 and 2019, we captured 20 and 26 adult female moose, respectively. We evaluated pregnancy status via pregnancy specific protein B, with subsequent visual observations through the calving period to document calf production and twinning rates. Based on these data, we estimated calf recruitment at ~11% and are expanding this work to radio-collar calves to estimate cause-specific mortality.

- Project Name:** Evaluation of the effects of fire on moose and forage quantity and quality in the Alphabet Hills of Unit 13 (Bill Collins, PI; Don Spalinger, co-PI). 2/2018 – 7/2022
- Purpose:** to evaluate the effects of fire on moose and their habitat in the Alphabet Hills prescribed burn areas in the Nelchina Basin in order to evaluate the use of prescribed fire as a management tool
- Objectives:**
 - Quantify moose browse quality, quantity, and proportional browse removal within the 2003/2004 Alphabet Hills burned areas, the 2020 planned Alphabet Hills burn area, and the unburned area.
 - Document and compare density, space-use, body condition, productivity, twinning rates, and survival of collared moose that are using burned and unburned area.
 - Monitor the immediate response of moose to prescribed fire and the moose colonization rate of previously burned areas.
 - Evaluate the usefulness of prescribed fire as a tool for habitat enhancement for moose.
- Status:** We captured and affixed GPS collars to 60 adult moose (50:50 male: female) during fall 2018 and spring 2019. We are currently monitoring adult and calf survival, twinning rates, and collecting location data for future demographic, movement, and habitat selection analyses. Working with Sue Rodman (ADFG), we anticipate continuing data collection to assess pre- and post-burn habitat use and response to fire. Further, we will use repeated sampling and captive animal trials to assess browse quality and quantity in context of moose demography to evaluate the potential for prescribed fire to improve moose population performance.

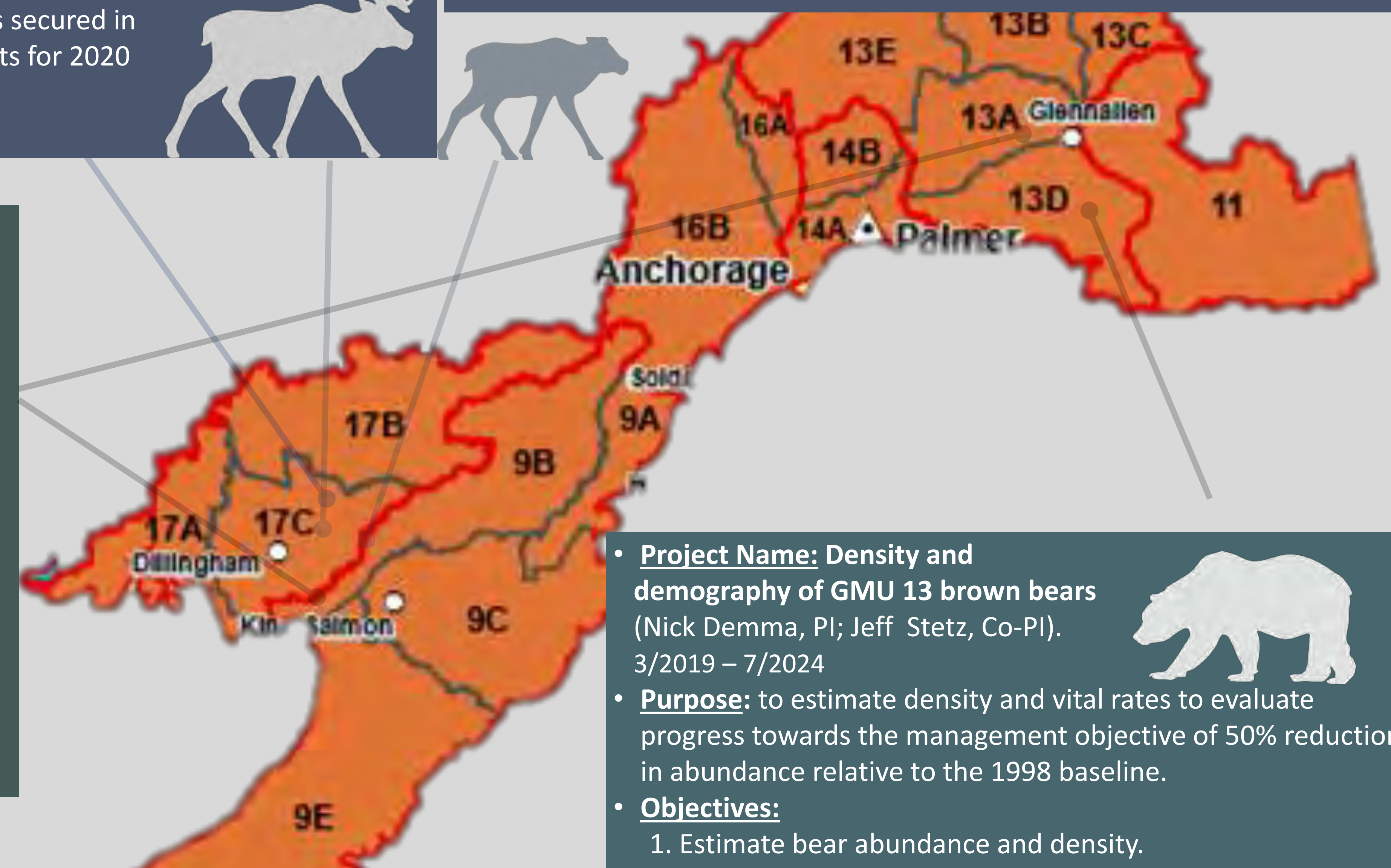


- Project Name:** Analysis of ungulate dietary composition and forage nutritional quality in Alaska (Bill Collins, PI; Don Spalinger, co-PI)
- Purpose:** to refine and provide appropriate nutritional analyses to researchers who are working to assess bottom-up factors regulating populations.
- Objectives:**
 - Determine dietary composition (e.g. species-specific) and nutritional quality (e.g. available protein) of archived fecal samples from the Togiak, Goodnews, Nushagak, and Coalville River moose populations and from Nelchina caribou wintering in the Tanana Hills.
- Status:** We have completed analyses for our Colville, Togiak, Seward Peninsula, and Y-K Delta projects. We have begun testing DNA barcoding as a means for determining diet composition, and we are comparing that technique with micro histological, fecal alkane-alcohol, and bite-count methods for moose and caribou samples. Additionally, we are providing an array of analyses of forage quality for large herbivores from across Alaska. We also raise captive moose and caribou for conducting digestions balance trials, assessing foraging behaviors, and microbiome responses to forage type and quality.

- Project Name:** Abundance, survival, and body condition in the Mulchatna caribou herd (MCH) in Units 17 & 18 (Renae Sattler, PI). 1/2020 – 4/2023
- Purpose:** to evaluate adult caribou survival, cause-specific mortality, and variation in reproductive success in the MCH to assess threats and identify areas where management actions would be most effective to achieve management objectives.
- Objectives:**
 - Estimate age-specific survival rates and identify the proximate cause of death in adult caribou.
 - Test the one herd hypothesis: evaluate the genetic structure within and between the east and west calving grounds and compare to estimates of herd mixing identified through GPS data.
 - Quantify the effects of caribou health and body condition (e.g. rump fat, serology, disease, and parasite load) on population growth rates and variation in individual reproductive success.
- Status:** Funding was secured in 2019 and field efforts for 2020 are underway.



- Project Name:** Mulchatna caribou herd (MCH) calf survival in Units 17 & 18 (Nick Demma, PI). 5/2018 – 7/2021
- Purpose:** to evaluate MCH calving and post-calving range use, and calf survival and mortality to inform an evaluation of the effectiveness of the MCH intensive management program.
- Objectives:**
 - Document location and timing of use of primary caribou calving and post-calving ranges associated with the MCH.
 - Evaluate survival of MCH calves from birth to 1-year-of age.
 - Characterize calf mortality patterns (timing, location, cause of death).
- Status:** From 2011 to present, we have radio-collared neonates (n=~80/yr) to estimate annual survival and investigate mortalities to determine cause of death. Calf survival from birth to 4.5 months of age has ranged from 0.25-0.65. The predominate cause of death of calves (< 1 month old) is predation (>80%), with a small number lost to drowning and starvation. We determine proximate cause of death from physical signs (e.g. prey remains, predator sign). Beginning this spring, we will collect DNA swabs from dead calves to test for the saliva of a predator to compare our determination of cause of death from physical signs to that from molecular techniques.



- Project Name:** Biometrics support (Meg Inokuma)
- Purpose:** To provide statistical support for project design and data analyses for Region IV and beyond.
- Objectives:**
 - Conduct annual population abundance estimates of several big-game species (e.g. Rivest estimator (caribou), GeoSpatial Population Estimator (moose), sight-ability correction factor modeling).
 - Unit17 moose calf survival
 - Variation in Mulchatna caribou survival
 - Estimate brown bear demographics in Unit 20, using an Integrated Population Model with harvest data

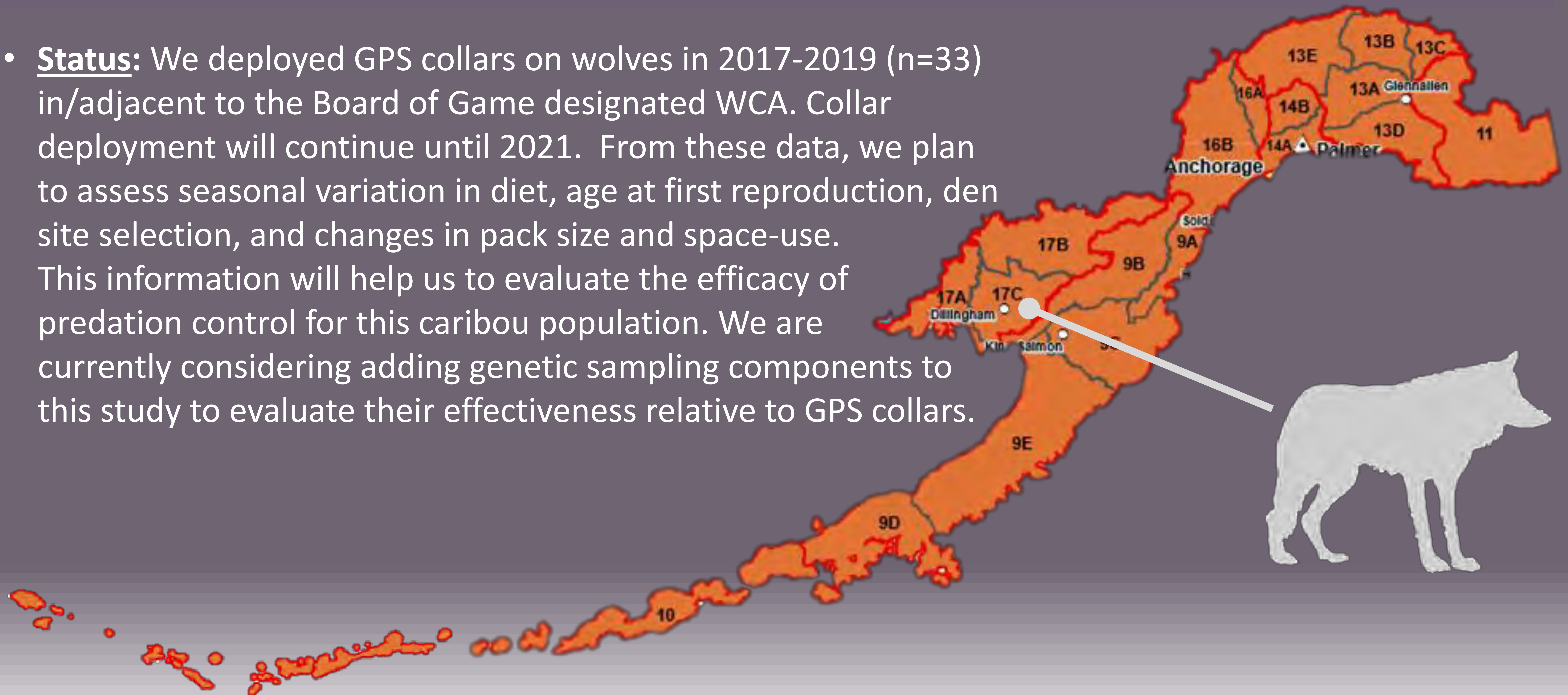
- Project Name:** Density and demography of GMU 13 brown bears (Nick Demma, PI; Jeff Stetz, Co-PI). 3/2019 – 7/2024
- Purpose:** to estimate density and vital rates to evaluate progress towards the management objective of 50% reduction in abundance relative to the 1998 baseline.
- Objectives:**
 - Estimate bear abundance and density.
 - Estimate vital rates for multiple sex-age classes.
 - Estimate population growth rate and annual harvest rate.
- Status:** In the fall of 2019, we fitted 11 adult brown bears with GPS collars, with additional collaring efforts planned for the spring and fall of 2020 and 2021. During summer 2020, we will collaborate with Ahtna, Inc., to conduct noninvasive genetic sampling to compliment GPS data and develop spatially-explicit capture-recapture models to produce independent estimates of density and other demographic parameters. Beyond expanding the spatial extent from previous bear research in this area, we will use these concurrently-collected data to assess performance of each suite of methods for long-term monitoring.



Wolf Abundance and Demography in Unit 17

(Nick Demma, PI). 03/2018-7/2021

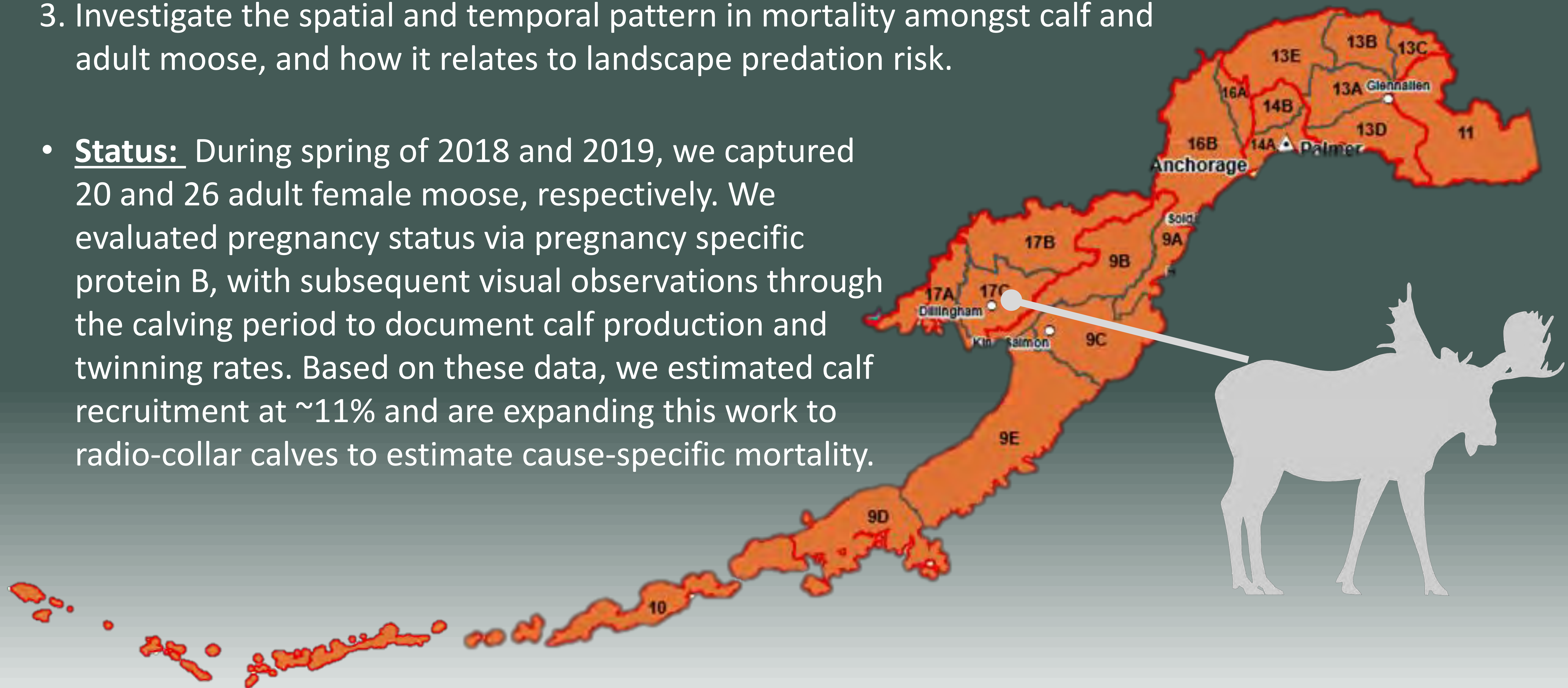
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- **Objectives:**
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 2. Document annual productivity, survival, and dispersal.
- **Status:** We deployed GPS collars on wolves in 2017-2019 (n=33) in/adjacent to the Board of Game designated WCA. Collar deployment will continue until 2021. From these data, we plan to assess seasonal variation in diet, age at first reproduction, den site selection, and changes in pack size and space-use. This information will help us to evaluate the efficacy of predation control for this caribou population. We are currently considering adding genetic sampling components to this study to evaluate their effectiveness relative to GPS collars.



Demography and sources of mortality in GMU 17 moose

(Kassie Colson, PI). 3/2018 – 11/2022

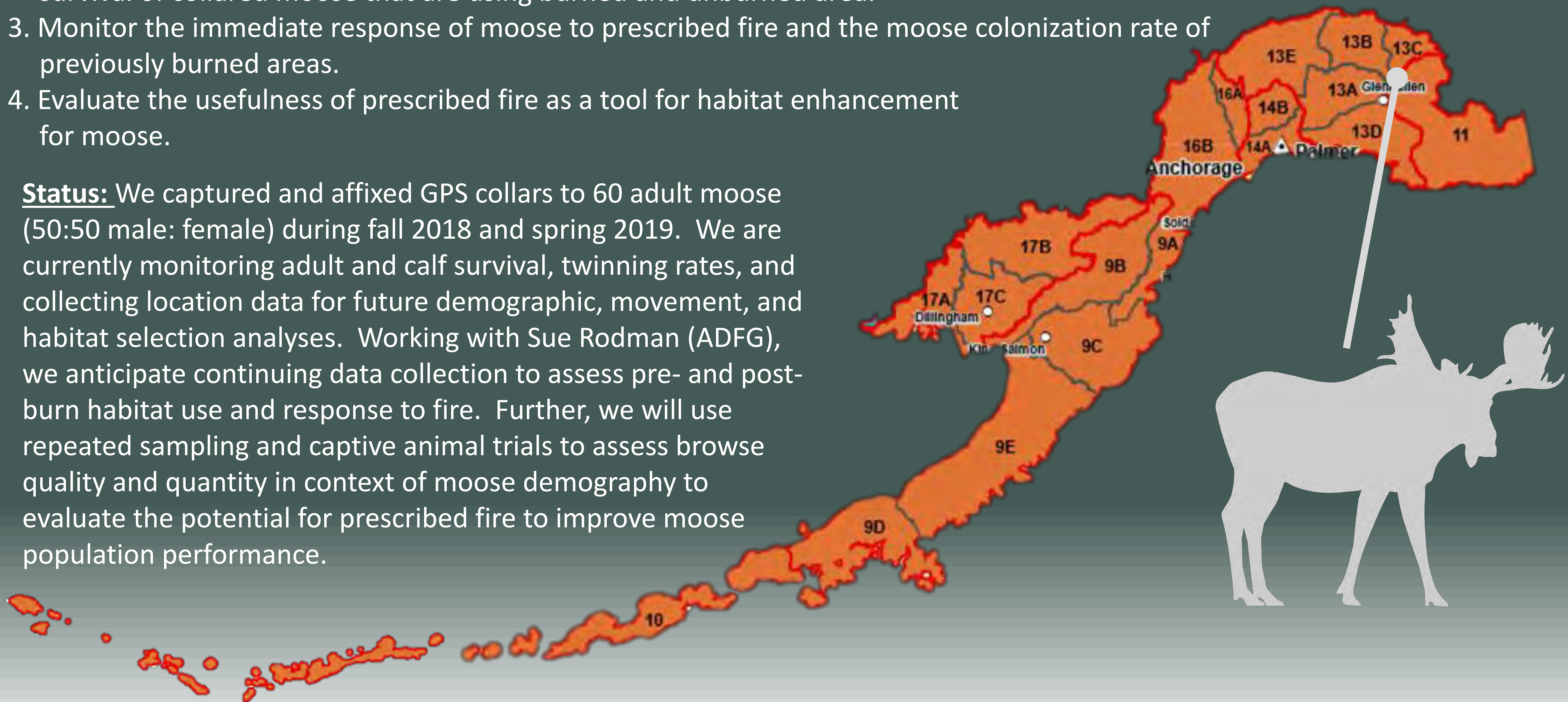
- **Purpose:** to determine the cause of a probable population decline in order to improve the management of this resource
- **Objectives:**
 1. Document reproductive and nutrition related metrics for Unit 17 moose.
 2. Determine survivorship of calf, yearling, two-year-old, and adult moose, as well as likely sources of mortality.
 3. Investigate the spatial and temporal pattern in mortality amongst calf and adult moose, and how it relates to landscape predation risk.
- **Status:** During spring of 2018 and 2019, we captured 20 and 26 adult female moose, respectively. We evaluated pregnancy status via pregnancy specific protein B, with subsequent visual observations through the calving period to document calf production and twinning rates. Based on these data, we estimated calf recruitment at ~11% and are expanding this work to radio-collar calves to estimate cause-specific mortality.



Evaluation of the effects of fire on moose and forage quantity and quality in the Alphabet Hills of Unit 13

(Bill Collins, PI; Don Spalinger, co-PI). 2/2018 – 7/2022

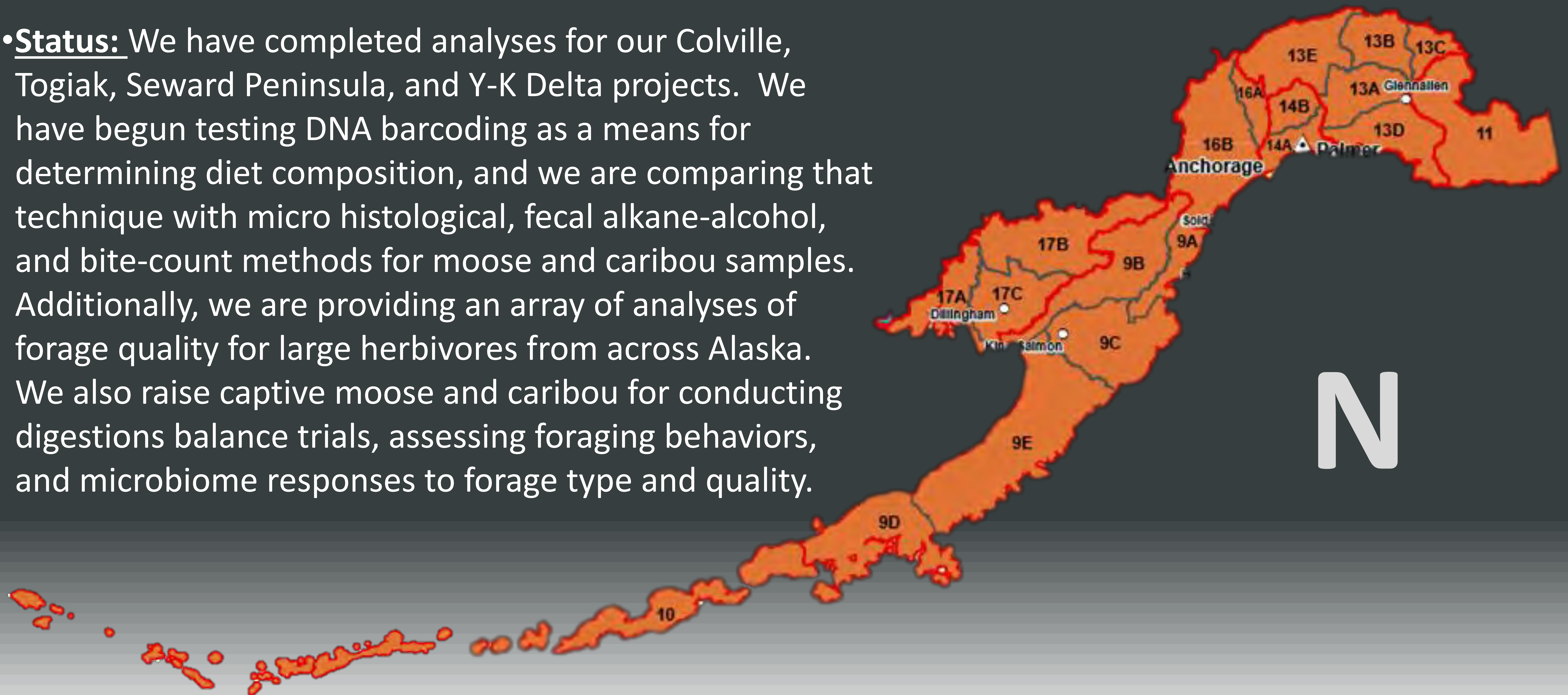
- **Purpose:** to evaluate the effects of fire on moose and their habitat in the Alphabet Hills prescribed burn areas in the Nelchina Basin in order to evaluate the use of prescribed fire as a management tool
- **Objectives:**
 1. Quantify moose browse quality, quantity, and proportional browse removal within the 2003/2004 Alphabet Hills burned areas, the 2020 planned Alphabet Hills burn area, and the unburned area.
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- **Status:** We captured and affixed GPS collars to 60 adult moose (50:50 male: female) during fall 2018 and spring 2019. We are currently monitoring adult and calf survival, twinning rates, and collecting location data for future demographic, movement, and habitat selection analyses. Working with Sue Rodman (ADFG), we anticipate continuing data collection to assess pre- and post-burn habitat use and response to fire. Further, we will use repeated sampling and captive animal trials to assess browse quality and quantity in context of moose demography to evaluate the potential for prescribed fire to improve moose population performance.



Analysis of ungulate dietary composition and forage nutritional quality in Alaska

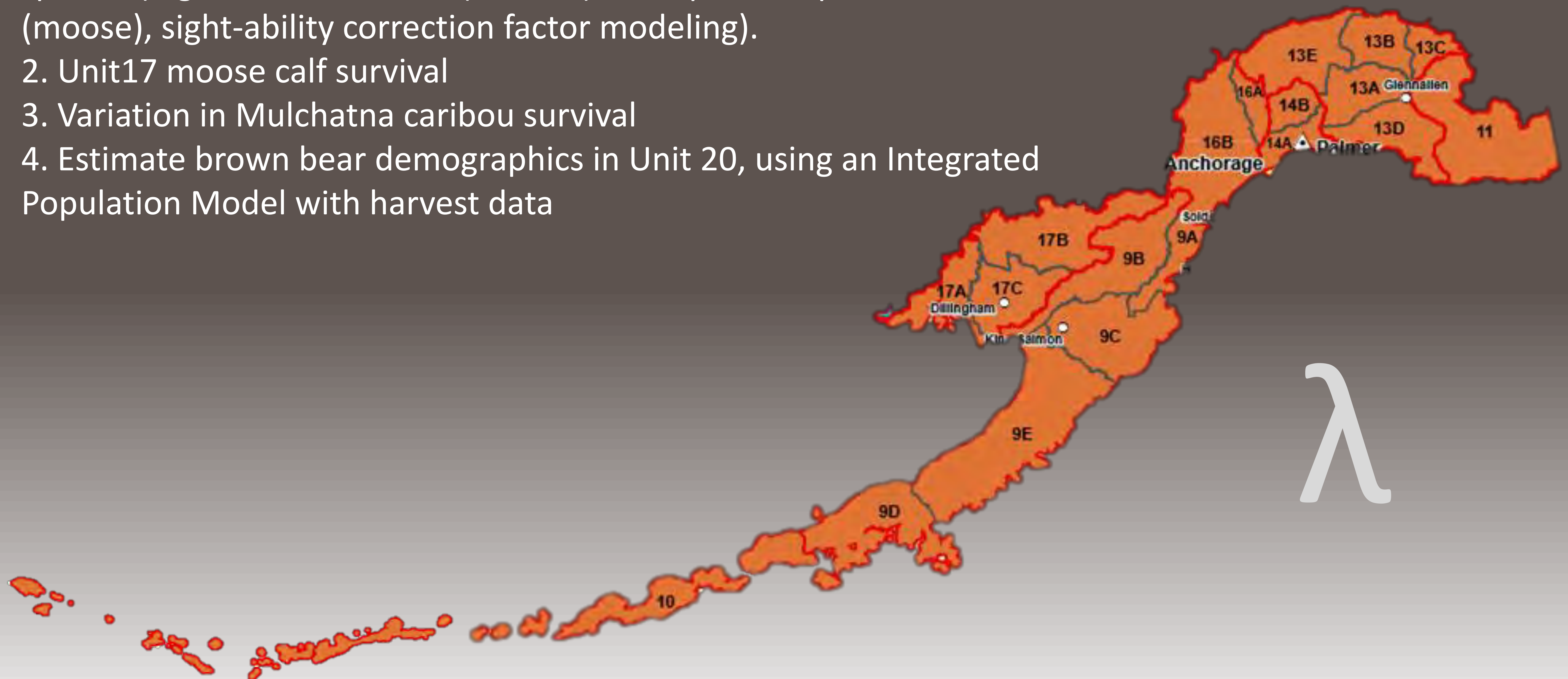
(Bill Collins, PI; Don Spalinger, co-PI)

- **Purpose:** to refine and provide appropriate nutritional analyses to researchers who are working to assess bottom-up factors regulating populations.
- **Objectives:**
 1. Determine dietary composition (e.g. species-specific) and nutritional quality (e.g. available protein) of archived fecal samples from the Togiak, Goodnews, Nushagak, and Coalville River moose populations and from Nelchina caribou wintering in the Tanana Hills.
- **Status:** We have completed analyses for our Colville, Togiak, Seward Peninsula, and Y-K Delta projects. We have begun testing DNA barcoding as a means for determining diet composition, and we are comparing that technique with micro histological, fecal alkane-alcohol, and bite-count methods for moose and caribou samples. Additionally, we are providing an array of analyses of forage quality for large herbivores from across Alaska. We also raise captive moose and caribou for conducting digestions balance trials, assessing foraging behaviors, and microbiome responses to forage type and quality.



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 2. Unit17 moose calf survival
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Density and demography of GMU 13 brown bears

(Nick Demma, PI; Jeff Stetz, Co-PI). 3/2019 – 7/2024

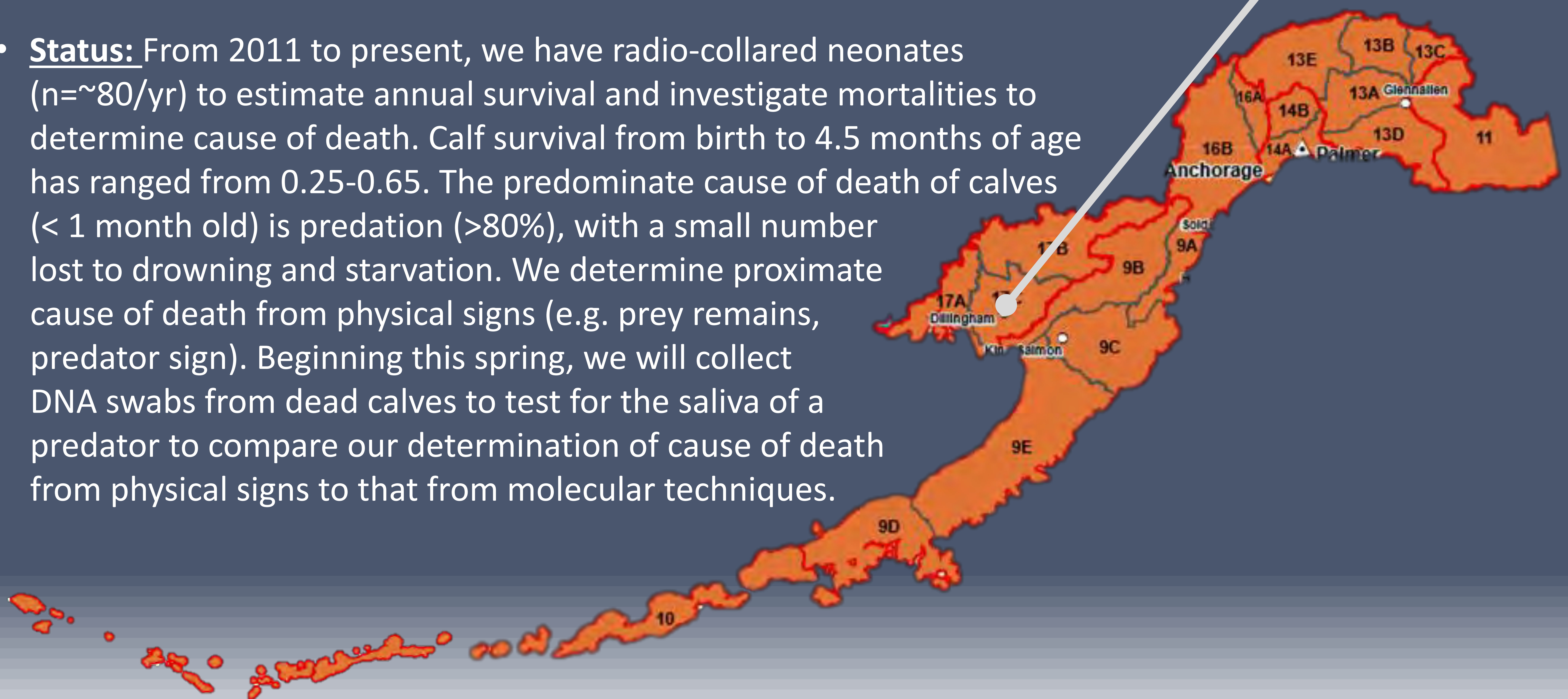
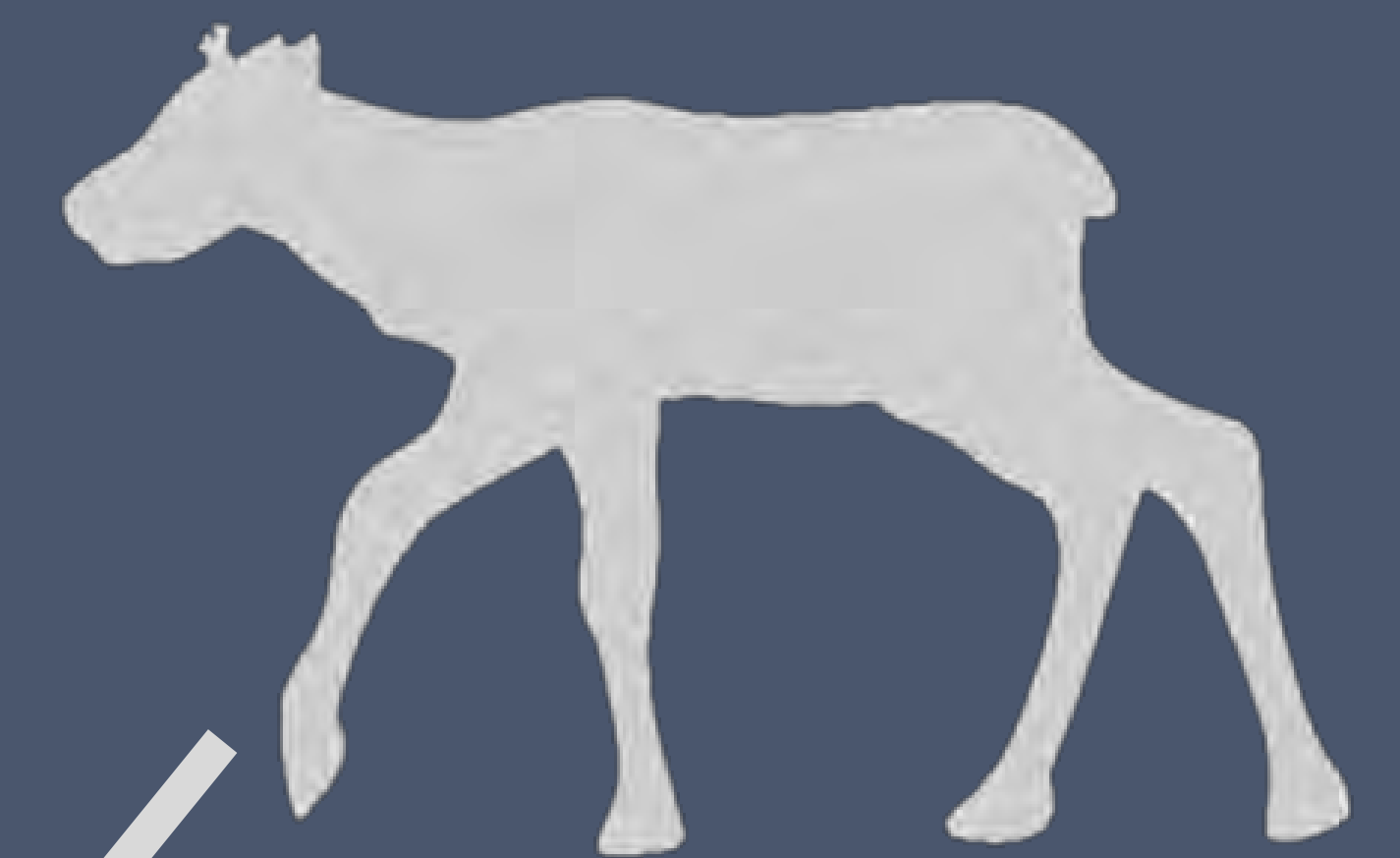
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Mulchatna caribou herd (MCH) calf survival in Units 17 & 18

(Nick Demma, PI). 5/2018 – 7/2021

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Abundance, survival, and body condition in the Mulchatna caribou herd (MCH) in Units 17 & 18

(Renae Sattler, PI). 1/2020 – 4/2023

- **Purpose:** to evaluate adult caribou survival, cause-specific mortality, and variation in reproductive success in the MCH to assess threats and identify areas where management actions would be most effective to achieve management objectives.
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- **Status:** Funding was secured in 2019 and field efforts for 2020 are underway.

