James M. Van Lanen

DIVISION OF SUBSISTENCE

Local Knowledge of the Mulchatna Caribou Herd and Wildlife Habitat in Alaska Game Management Units 9B-C, 17, 18, and 19A-B

Alaska Board of Game
Dillingham, Alaska
February 2018

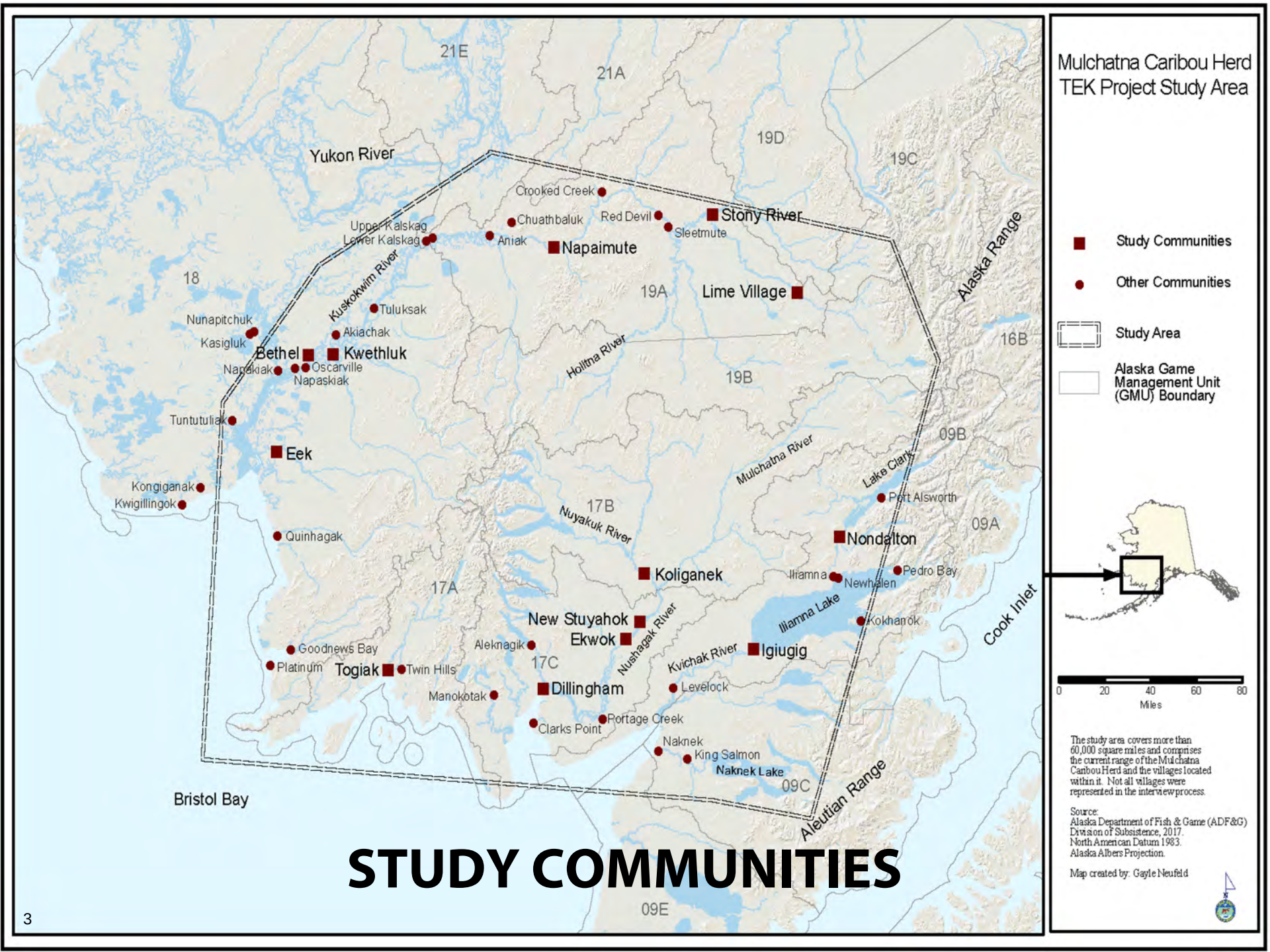
Project Funding
provided by
Western Alaska Landscape
Conservation Cooperative
Award # F16AC00290

Project Dates

May 2016 - March 2018

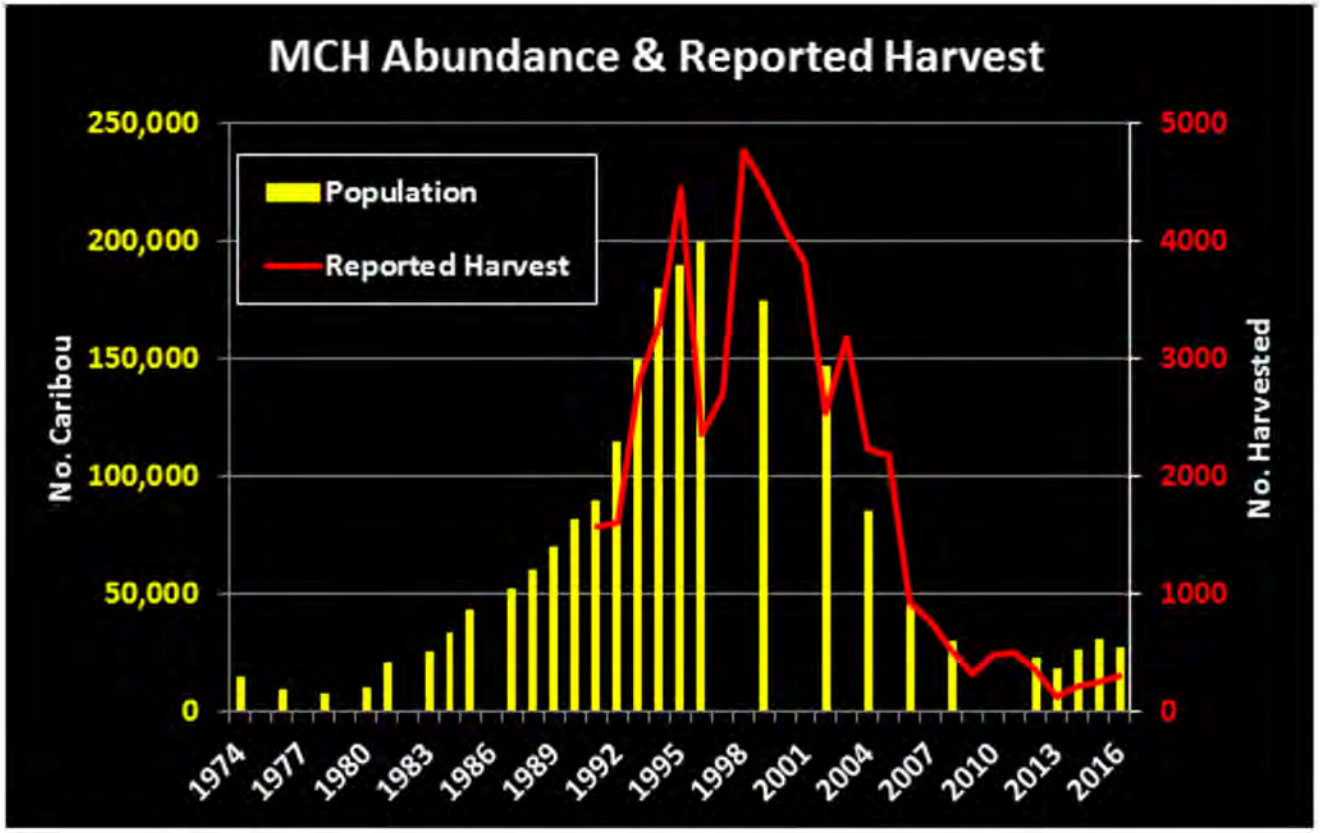
PROJECT PARTNERS

- ADF&G Division of Subsistence,
  - James Van Lanen
  - Chris McDevitt
  - Gayle Neufeld
- Bristol Bay Native Association
  - Gayla Hoseth
- Lake Clark National Park
  - Karen Evanoff



STUDY COMMUNITIES

Mulchatna Caribou Herd (MCH) Population Estimates and Reported Harvest: 1974–2016



Source: ADF&G Division of Wildlife Conservation

MCH Local Knowledge Project Goals and Objectives

- Document local knowledge of caribou distribution over the previous 50 years
- Document shifts in subsistence uses of caribou, particularly related to access
- Gather geospatial information via participatory landscape mapping
- Produce a detailed map series which visually displays local observations.
- Integrate local and scientific knowledge

Participatory Landscape Mapping

‘Over the past five decades, what is the local knowledge of the MCH in relationship to’:

- Seasonal movements
- Calving
- Caribou abundance
- Vegetation establishment
- Weather and snow conditions
- Other wildlife
- Hunting locations
- Hunting strategies and access

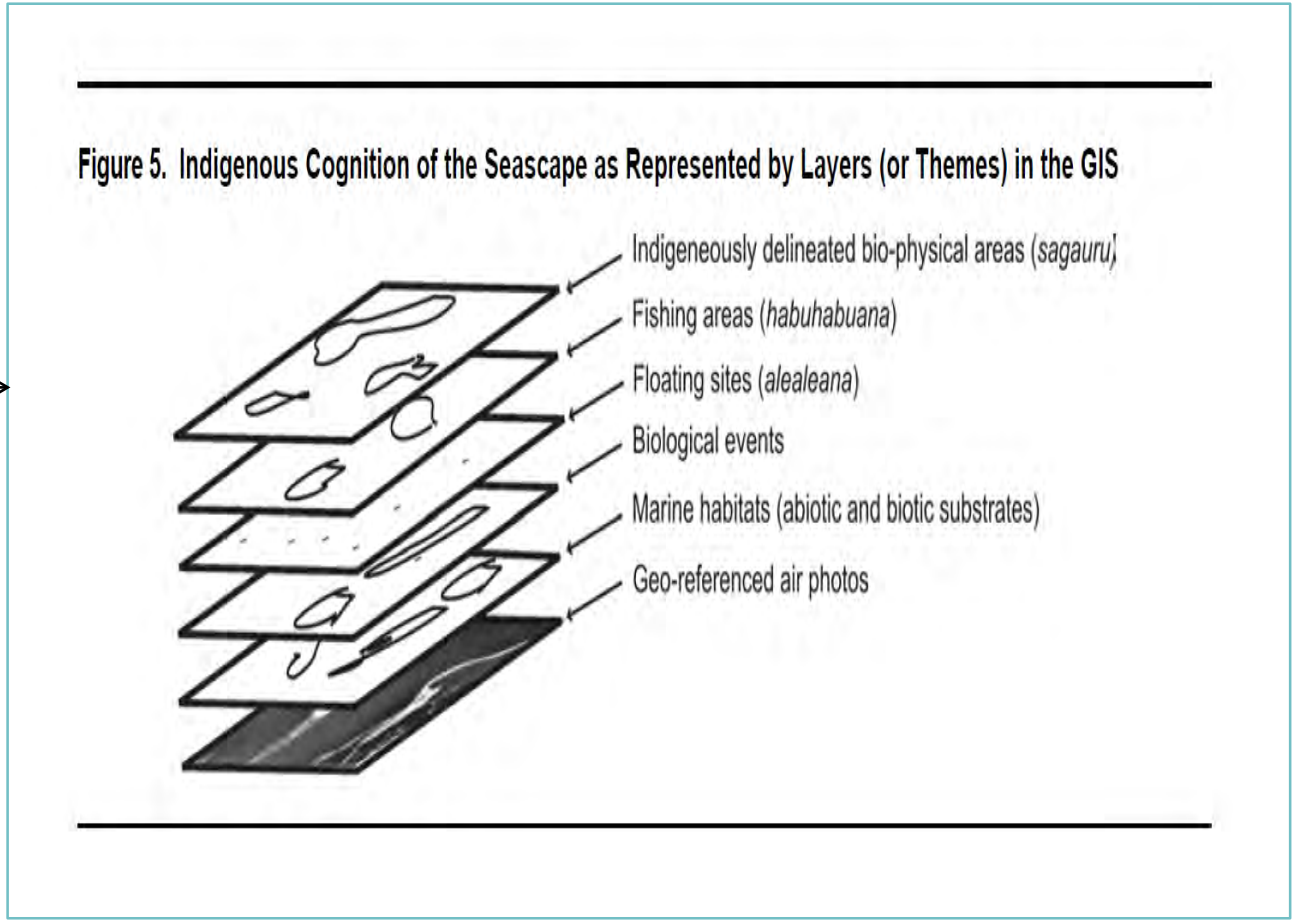
Participatory Mapping In-Field Map Production - Timeframes

Mapping interviews focused on 6 specific timeframes

1960s	1970s	1980s
1990s	2000s	2010-2015

GIS Layer Production

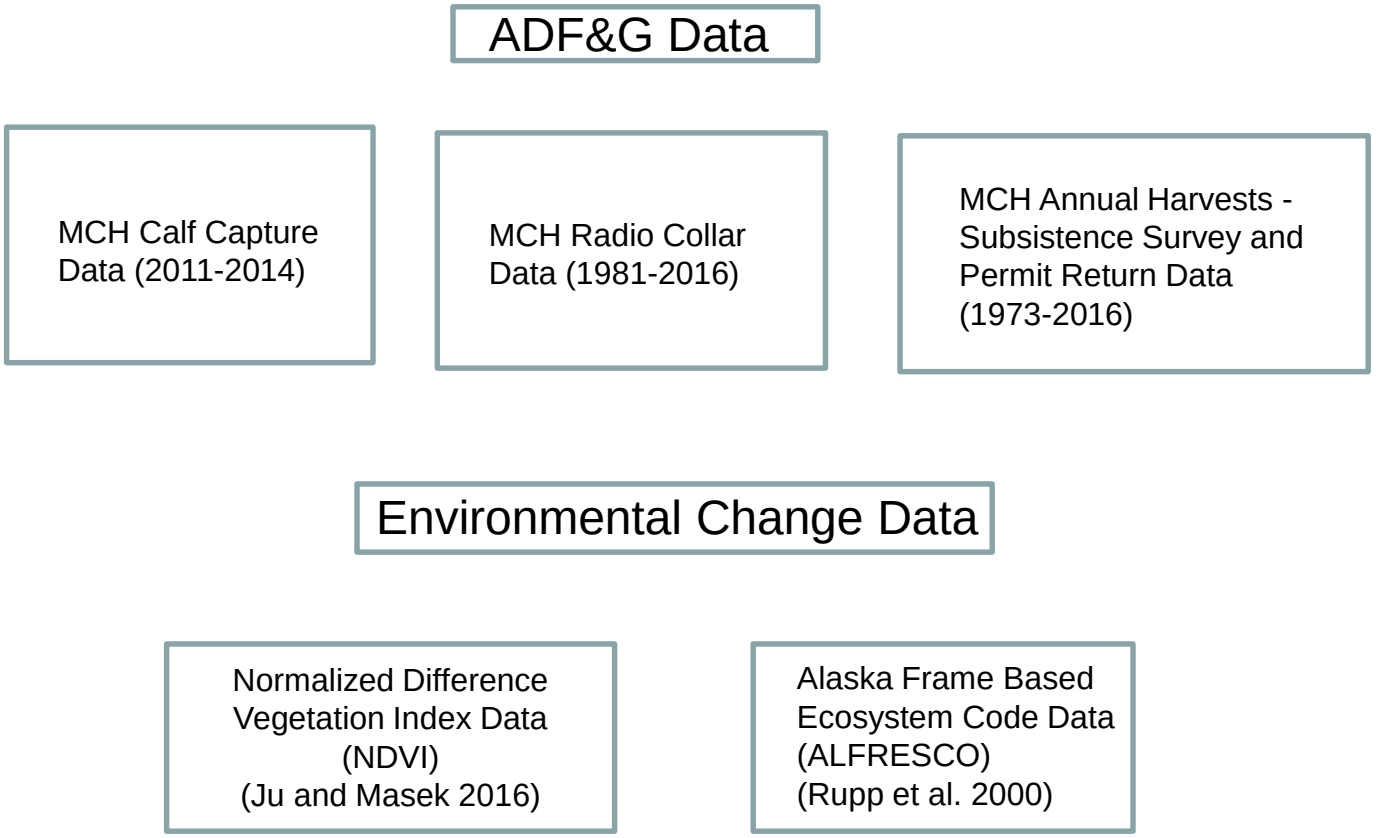
Example of GIS Layering Process for Local Knowledge Landscape Mapping



Aswani, Shankar, and Matthew Lauer. “Incorporating Fishermen’s Local Knowledge and Behavior into Geographical Information Systems (GiS) for Designing Marine Protected Areas in Oceania.” Human Organization 65, no. 1 (2006): 81–102.

Data Integration — Biological Data Review and Map Production

- Utilize ADFG data and other data products wherever appropriate
- (Re)produce relevant GIS layers for overlays where applicable/necessary

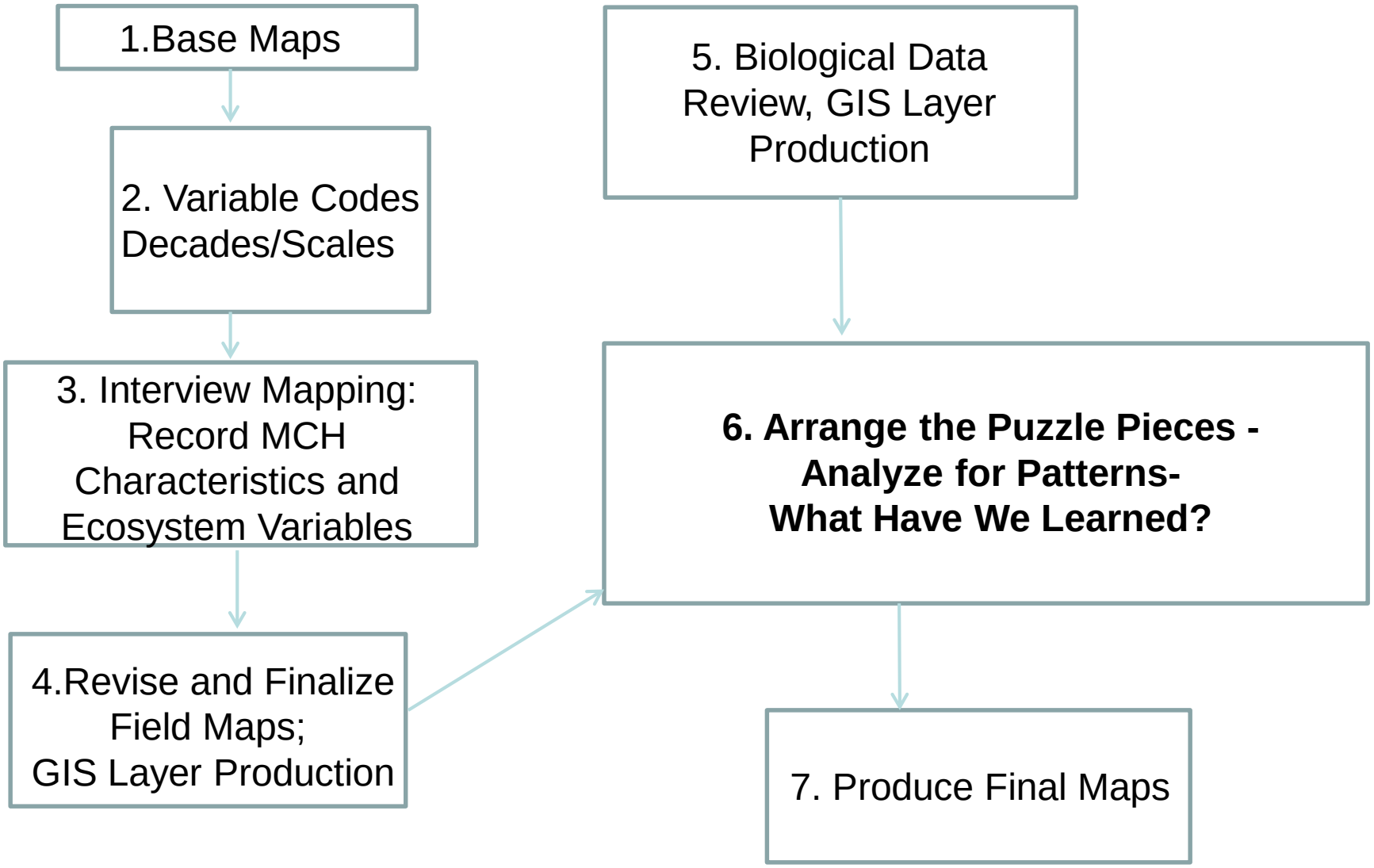


Ju, Junchang, and Jeffrey G. Masek. 2016. “The Vegetation Greenness Trend in Canada and US Alaska from 1984–2012 Landsat Data.” Remote Sensing of Environment 176: 1–16.

Rupp, T. Scott, Anthony M. Starfield, and F. S. Chapin. 2000. “A Frame-Based Spatially Explicit Model of Subarctic Vegetation Response to Climatic Change: Comparison with a Point Model.” Landscape Ecology, no. 15: 383–400.

MCH Local Knowledge Landscape Mapping Workflow — Summary

Elements



Field Results

July 2016–March 2017

- 32 participatory mapping interviews with members of 13 communities
- 105 field maps produced
- Participant Observation

Local Knowledge of Caribou Abundance

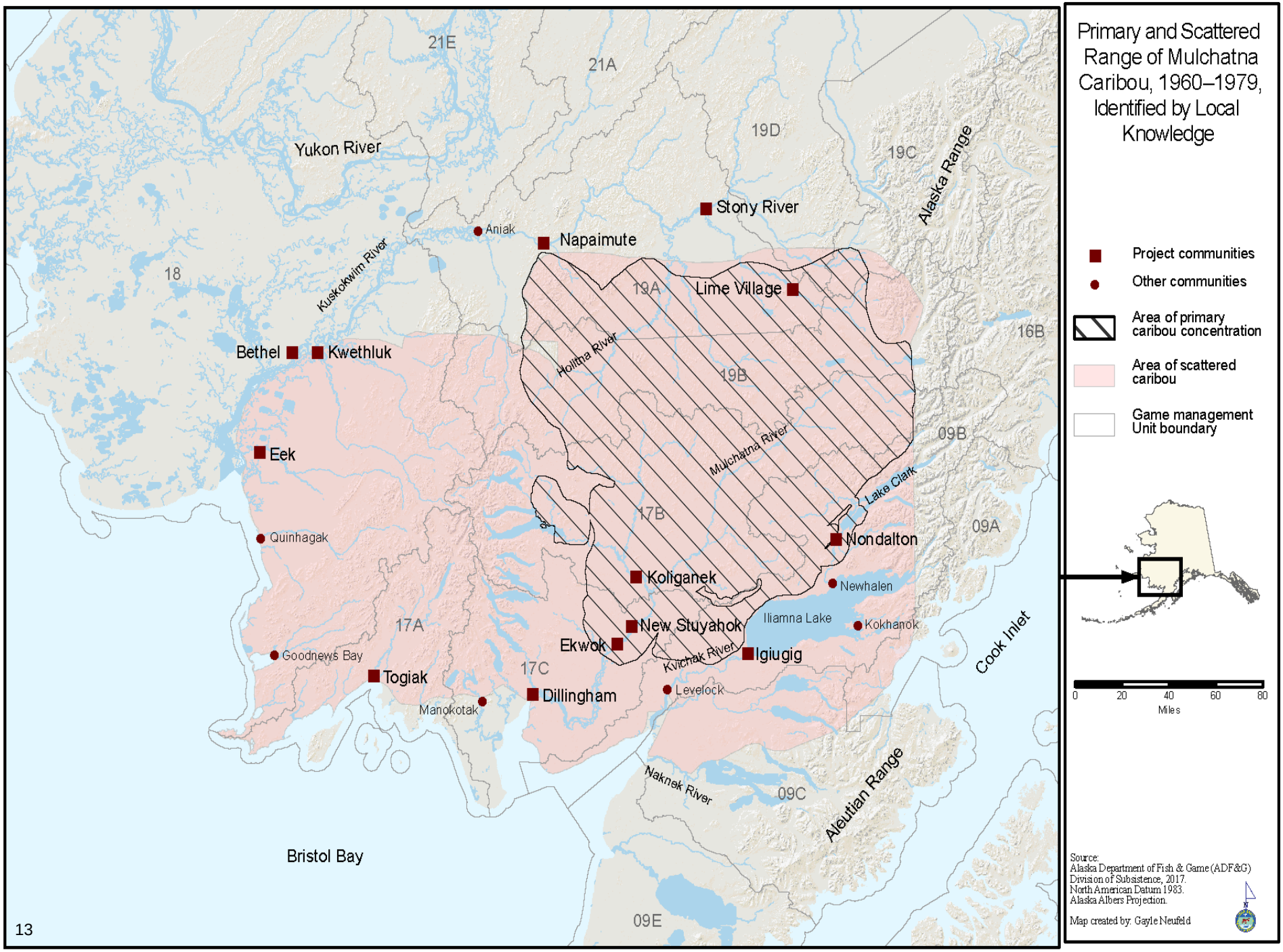
Defining Abundance : Concentrated vs. Scattered

'Concentrated' – primary range, or areas where large aggregations of caribou, or an abundance of caribou, were observed or expected

'Scattered' – areas where single or small groups of caribou were encountered, or where the possibility of encountering caribou was/is extant

MCH Ecology = Metapopulation

Hinkes, Michael T., Gail H. Collins, Lawrence J. Van Daele, Steven D. Kovach, Andrew R. Aderman, James D. Woolington, and Roger J. Seavoy. 2005. "Influence of Population Growth on Caribou Herd Identity, Calving Ground Fidelity, and Behavior." *Journal of Wildlife Management* 69 (3): 1147–1162.


Primary and Scattered Range of Mulchatna Caribou, 1960–1979, Identified by Local Knowledge
Project communities
Other communities
Area of primary caribou concentration
Area of scattered caribou
Game management Unit boundary
0 20 40 60 80
Miles
Source:
Alaska Department of Fish & Game (ADF&G) Division of Subsistence, 2017.
North American Datum 1983.
Alaska Albers Projection.
Map created by: Gayle Neufeld
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Bethel
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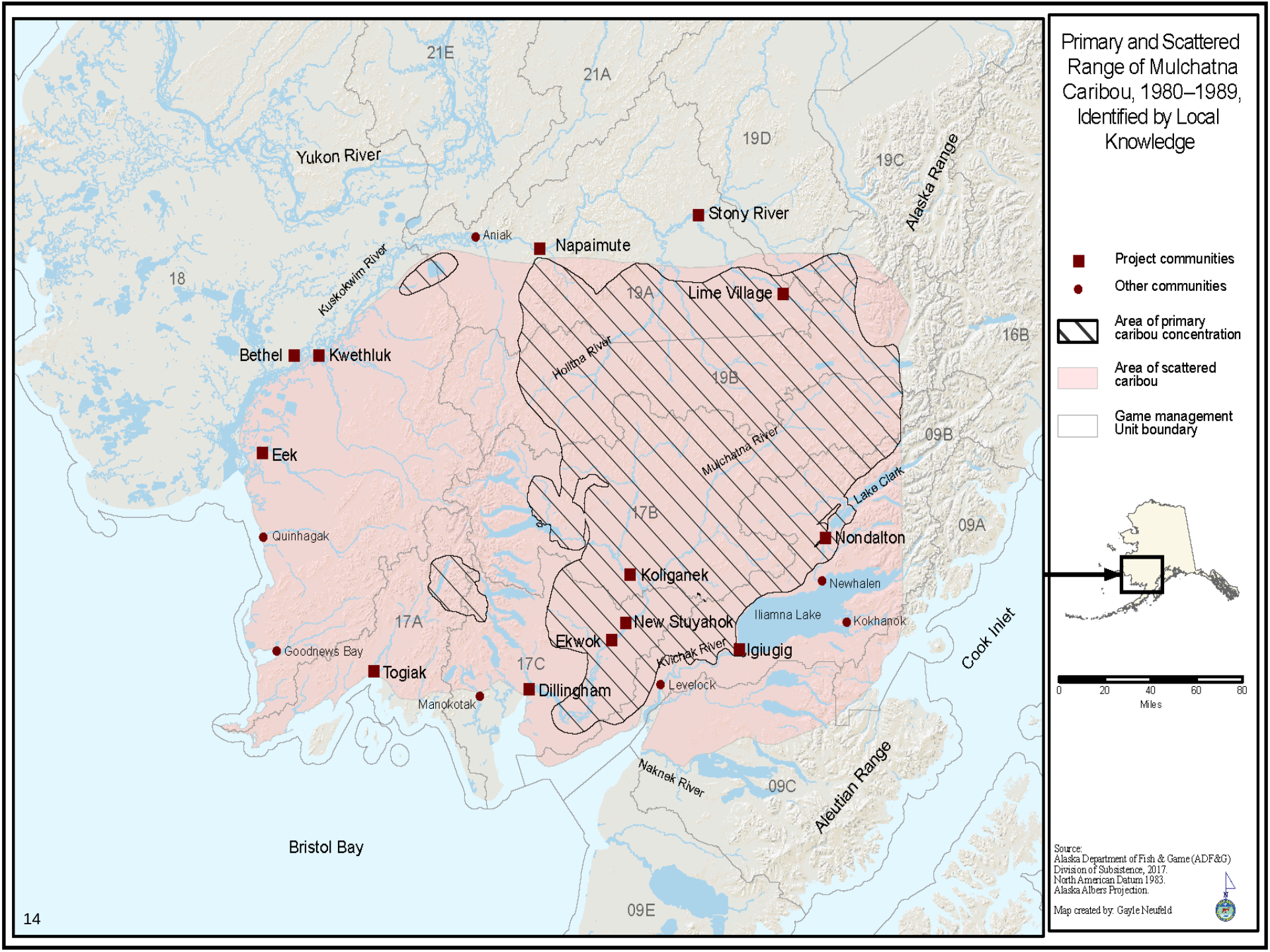
Newhalen
New Stuyahok
Ekwok
Igiugig
Kokhanok
Levelock


Primary and Scattered Range of Mulchatna Caribou, 1980–1989, Identified by Local Knowledge
Project communities
Other communities
Area of primary caribou concentration
Area of scattered caribou
Game management Unit boundary
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Miles
Source:
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Kvichak River
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Togiak
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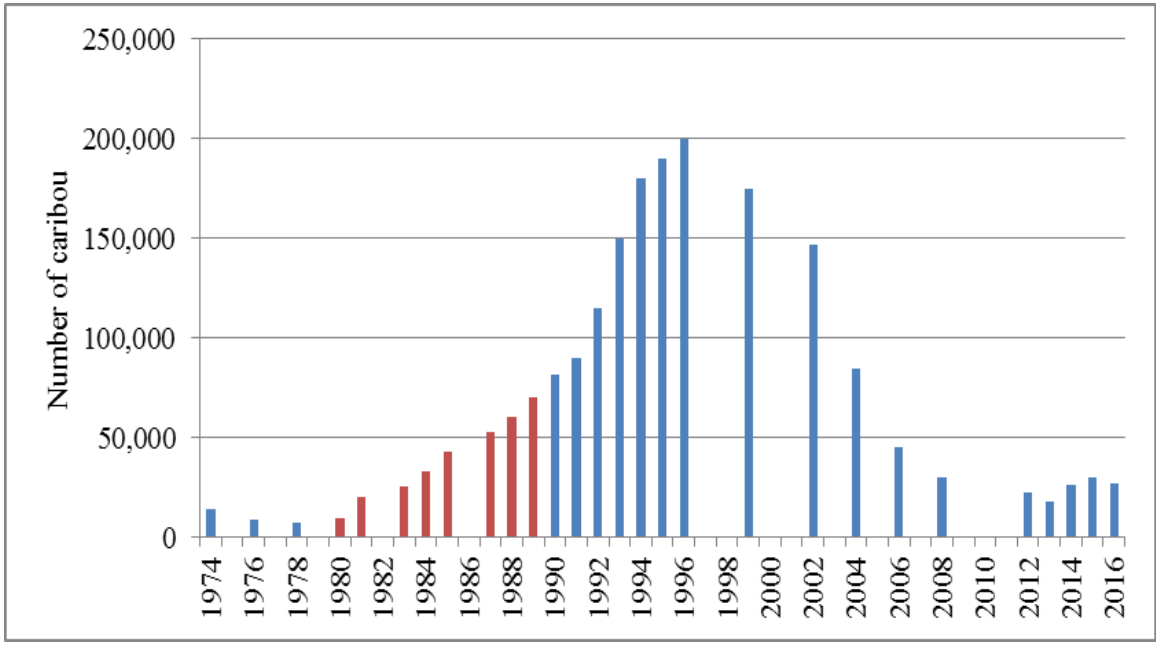
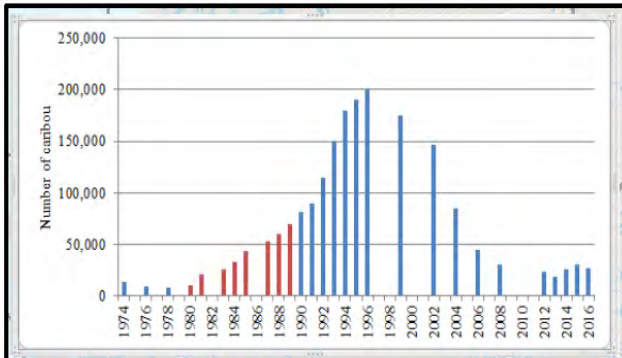
Naknek River
Aleutian Range
Bristol Bay
14

MCH Population Estimates: 1980s





Density of Mulchatna Caribou based on Radio Telemetry Data and Local Knowledge in the 1980s

Project communities
Other communities
Kernel Density Estimates
Concentrated
Scattered
Local Knowledge
Concentrated
Scattered
Game Management Unit boundary

0 20 40 60 80
Miles

This map depicts kernel density estimates (kde) for the Mulchatna caribou herd. The estimates were derived from location data from the 19800s of radio collared caribou, shown in red in the graph in the top left corner of the map. Areas of concentrated and scattered caribou obtained from local knowledgeis overlaid on the kde.

Source:
Alaska Department of Fish & Game (ADF&G)
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North American Datum 1983.
Alaska Albers Projection.

Map created by: Gayle Neufeld

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Newhalen
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Cook Inlet
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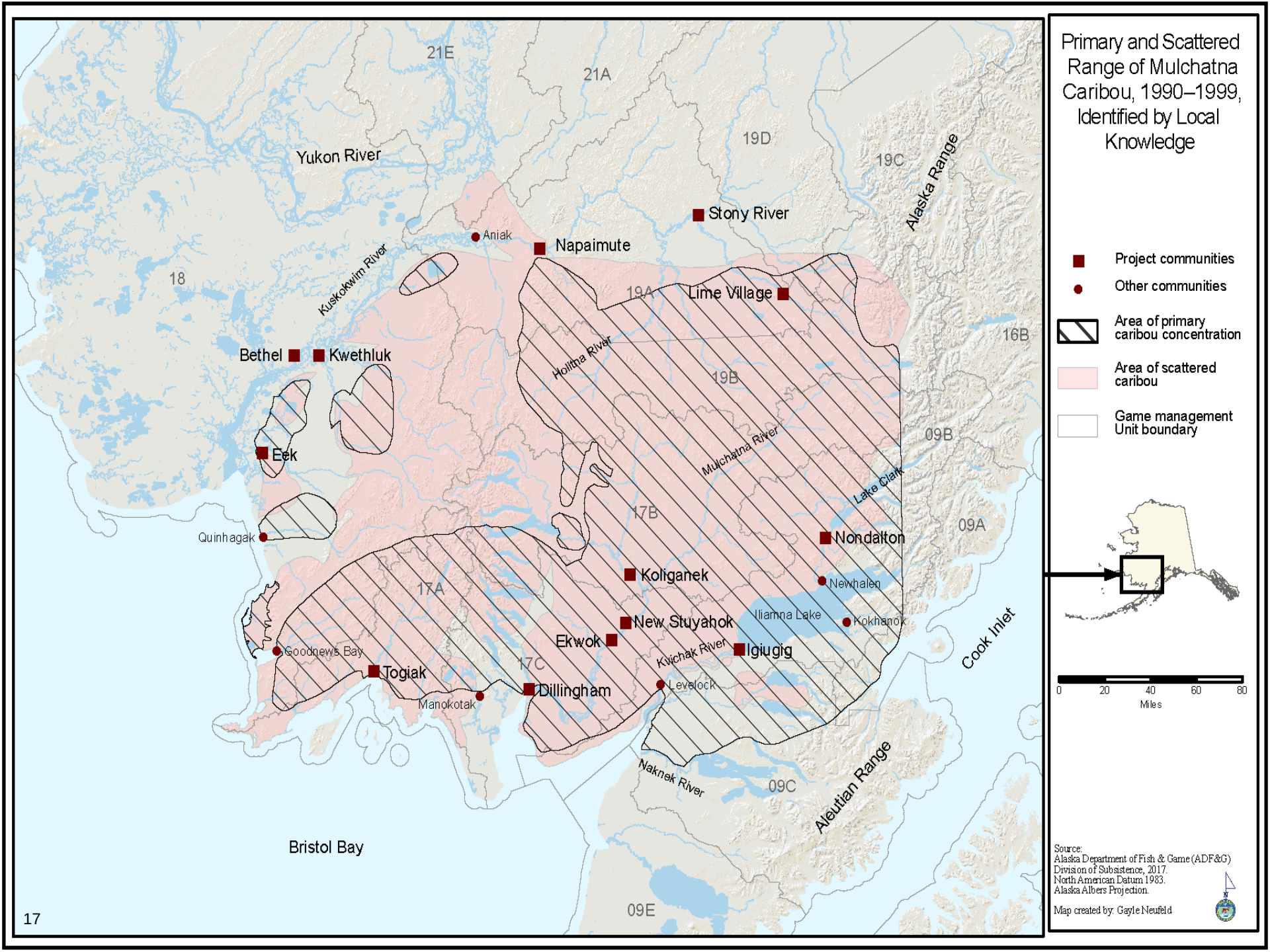
Aleutian Range
Bristol Bay


Primary and Scattered Range of Mulchatna Caribou, 1990–1999, Identified by Local Knowledge
Project communities
Other communities
Area of primary caribou concentration
Area of scattered caribou
Game management Unit boundary
0 20 40 60 80
Miles
Source:
Alaska Department of Fish & Game (ADF&G)
Division of Subsistence, 2017.
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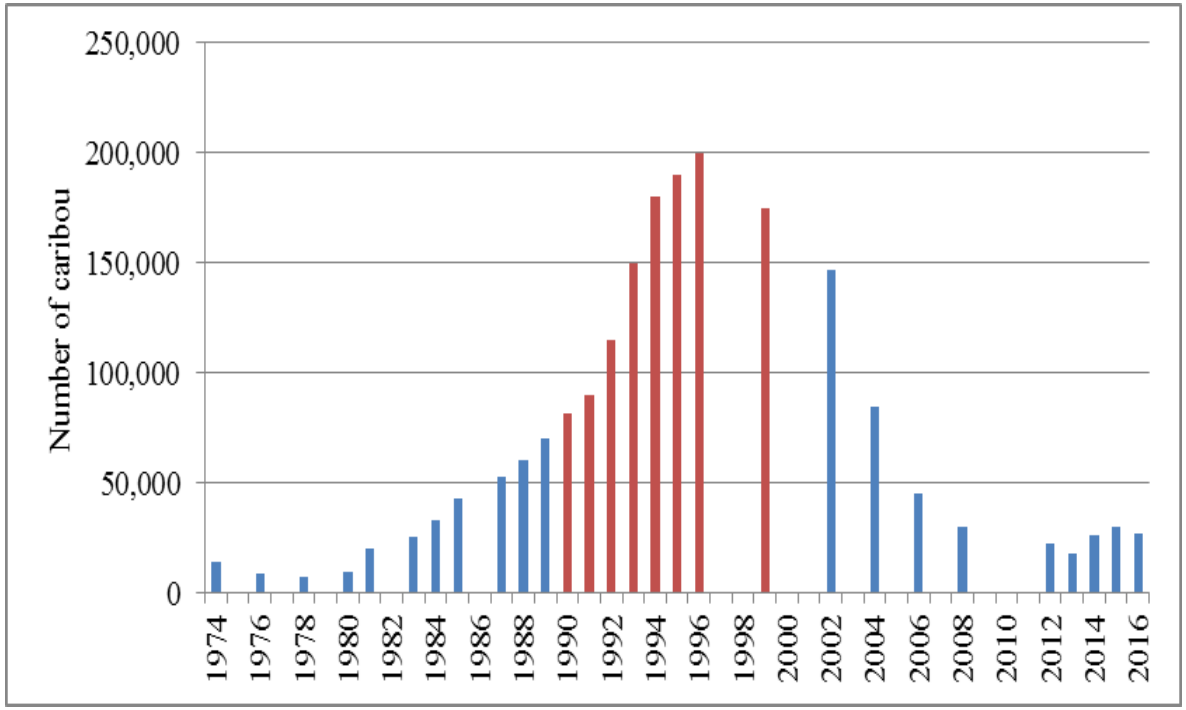
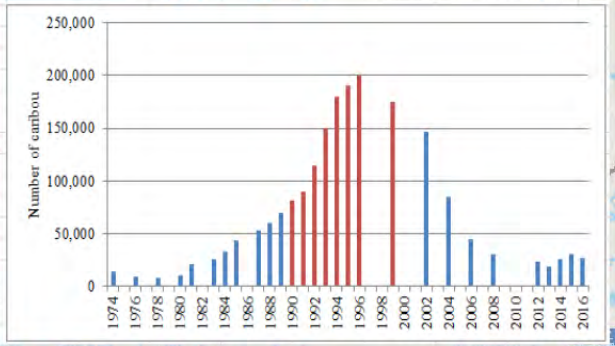
MCH Population Estimates: 1990s





Density of Mulchatna Caribou based on Radio Telemetry Data and Local Knowledge in the 1990s

Project communities
Other communities
Kernel Density Estimates
Concentrated
Scattered
Local Knowledge
Concentrated
Scattered
Game Management Unit boundary

0 20 40 60 80
Miles

This map depicts kernel density estimates (kde) for the Mulchatna caribou herd. The estimates were derived from location data from the 1990s of radio collared caribou, shown in red in the graph in the top left corner of the map. Areas of concentrated and scattered caribou obtained from local knowledgeis overlaid on the kde.

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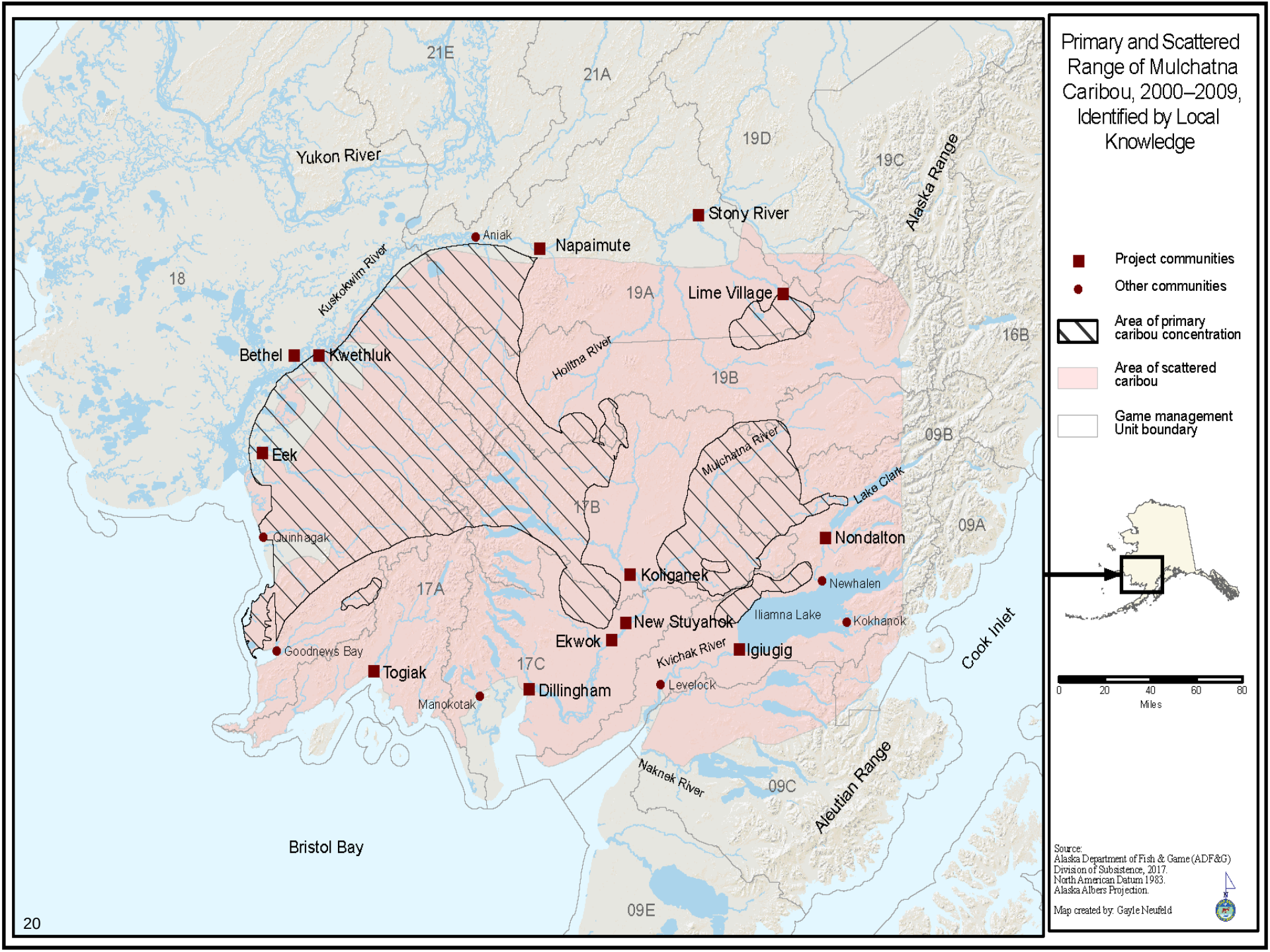
Primary and Scattered Range of Mulchatna Caribou, 2000–2009, Identified by Local Knowledge
Project communities
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Area of scattered caribou
Game management Unit boundary
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Miles
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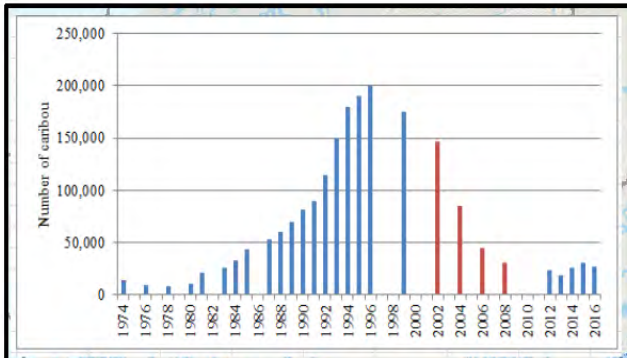
Kokhanok
Ekwok
Kvichak River
Igiugig
Goodnews Bay
Togiak
Dillingham
Levelock
Manokotak
Cook Inlet
Naknek River
Aleutian Range
Bristol Bay
20



Density of Mulchatna Caribou based on Radio Telemetry Data and Local Knowledge in the 2000s

Project communities

Other communities

Kernel Density Estimates

Concentrated

Scattered

Local Knowledge

Concentrated

Scattered

Game Management Unit boundary

0 20 40 60 80

Miles

This map depicts kernel density estimates (kde) for the Mulchatna caribou herd. The estimates were derived from location data from the 2000s of radio collared caribou, shown in red in the graph in the top left corner of the map. Areas of concentrated and scattered caribou obtained from local knowledgeis overlaid on the kde.

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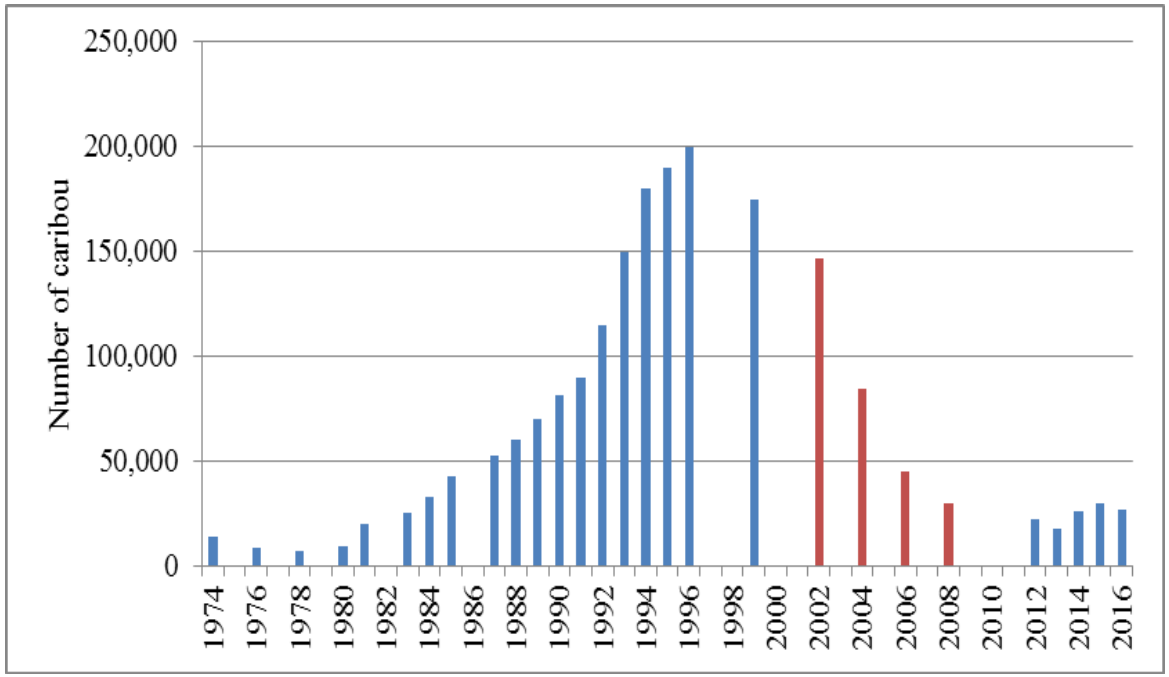
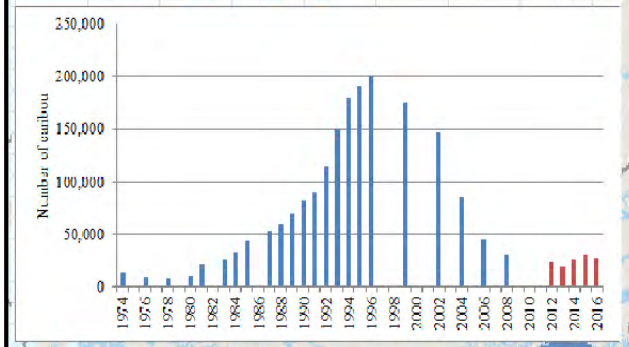
Dillingham
Koliganek
New Stuyahok
Ekwok
Levelock
Igiugig
Iliamna Lake
Kokhanok
Newhalen
Nondalton

21

MCH Population Estimates: 2002–2008





Density of Mulchatna Caribou based on Radio Telemetry Data and Local Knowledge in the 2010s

Project communities

Other communities

Kernel Density Estimates

Concentrated

Scattered

Local Knowledge

Concentrated

Scattered

Game Management Unit boundary

0 20 40 60 80

Miles

This map depicts kernel density estimates (kde) for the Mulchatna caribou herd. The estimates were derived from location data from the 2010s of radio collared caribou, shown in red in the graph in the top left corner of the map. Areas of concentrated and scattered caribou obtained from local knowledgeis overlaid on the kde.

Source:
Alaska Department of Fish & Game (ADF&G)
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Alaska Albers Projection.

Map created by: Gayle Neufeld

Stony River
Aniak
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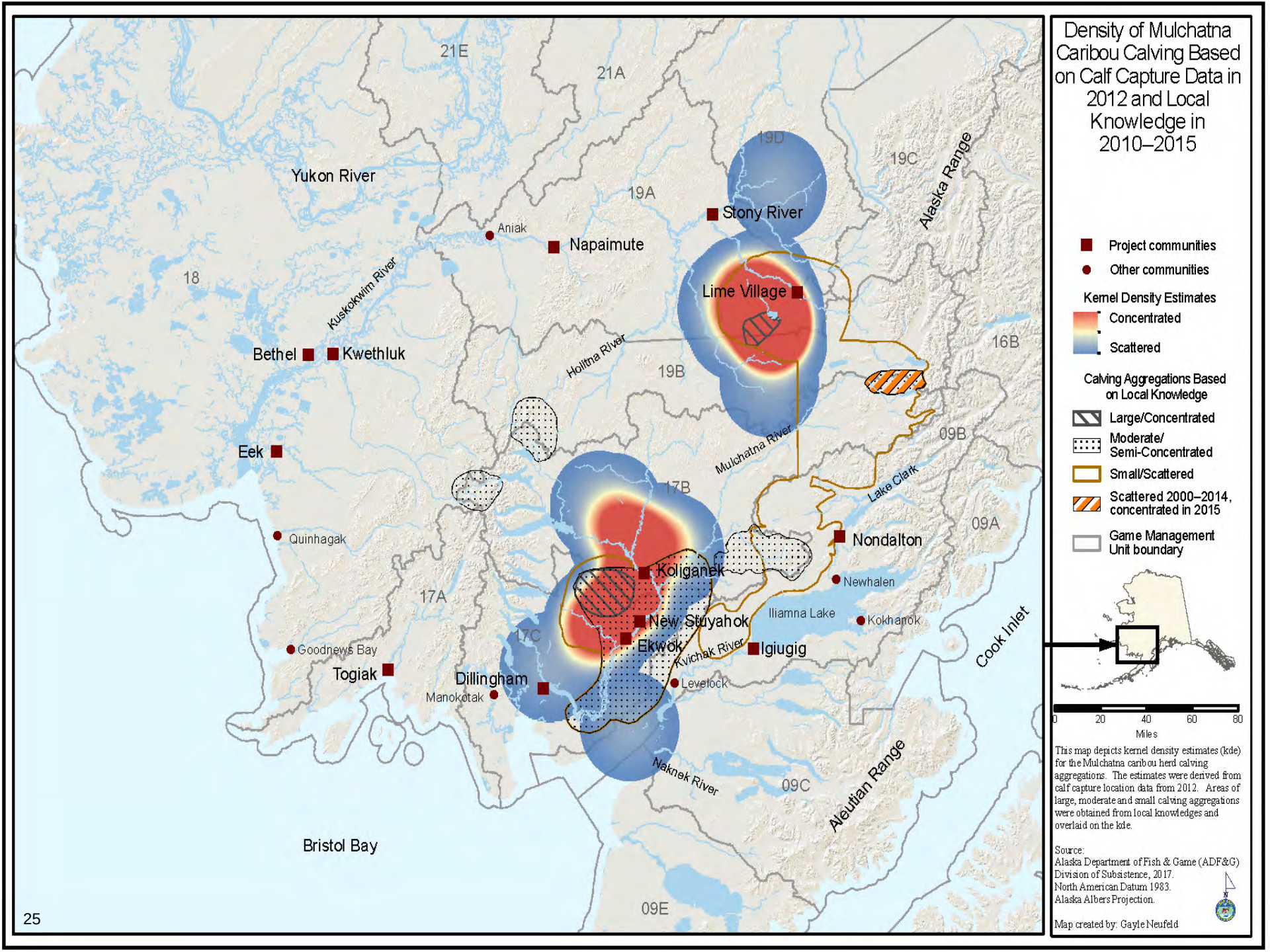
Local Knowledge of Calving Behavior

Defining Calving Aggregations:

- Concentrated
- Semi-Concentrated
- Scattered


Density of Mulchatna Caribou Calving Based on Calf Capture Data in 2012 and Local Knowledge in 2010–2015
Project communities
Other communities
Kernel Density Estimates
Concentrated
Scattered
Calving Aggregations Based on Local Knowledge
Large/Concentrated
Moderate/ Semi-Concentrated
Small/Scattered
Scattered 2000–2014, concentrated in 2015
Game Management Unit boundary
0 20 40 60 80
Miles
This map depicts kernel density estimates (kde) for the Mulchatna caribou herd calving aggregations. The estimates were derived from calf capture location data from 2012. Areas of large, moderate and small calving aggregations were obtained from local knowledges and overlaid on the kde.
Source:
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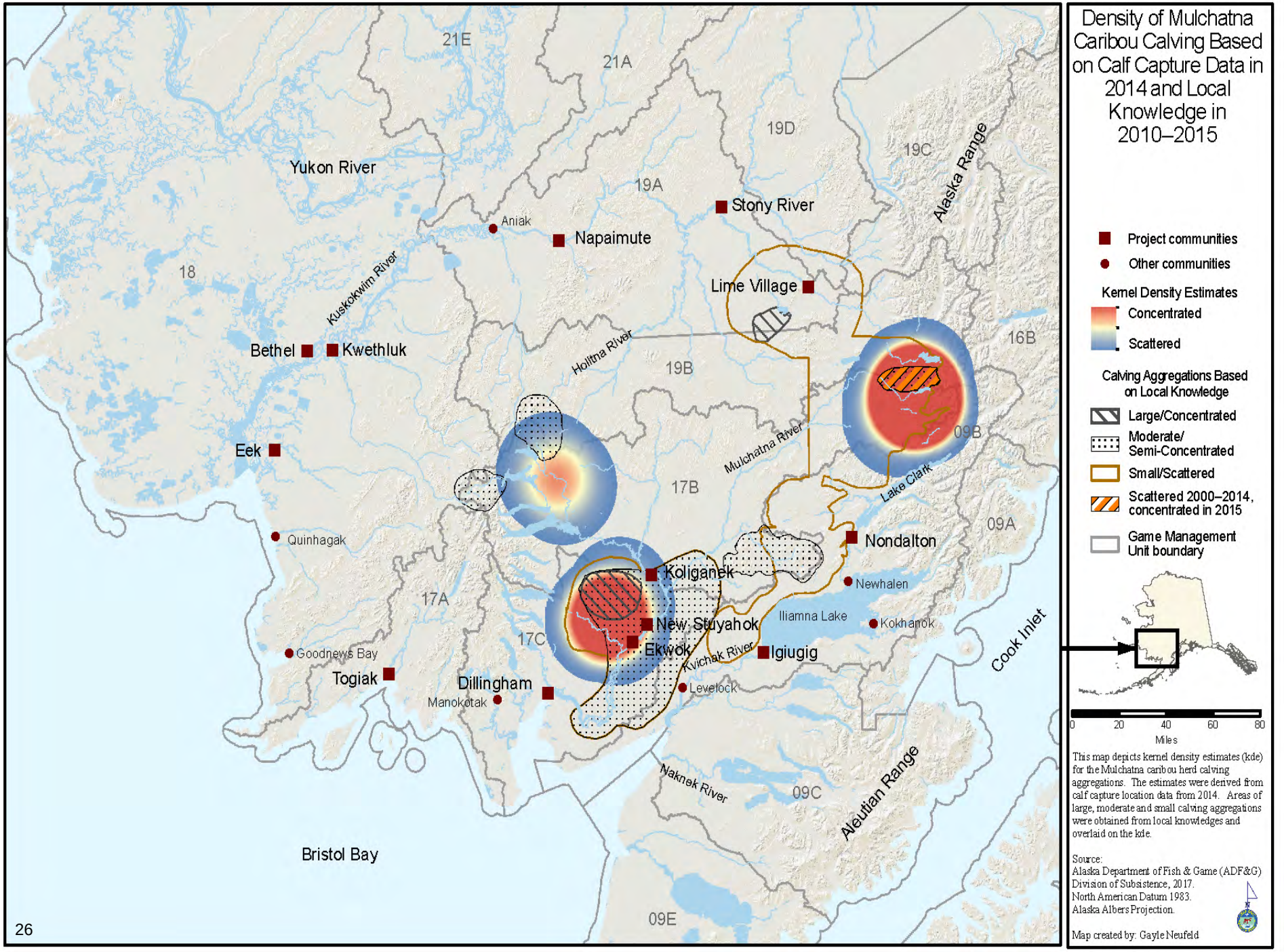
Density of Mulchatna Caribou Calving Based on Calf Capture Data in 2014 and Local Knowledge in 2010–2015
Project communities
Other communities
Kernel Density Estimates
Concentrated
Scattered
Calving Aggregations Based on Local Knowledge
Large/Concentrated
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Small/Scattered
Scattered 2000–2014, concentrated in 2015
Game Management Unit boundary
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Miles
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Newhalen
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Local Knowledge of Shifting Caribou Dynamics

Local perspective on causes of westerly range shift and population decline

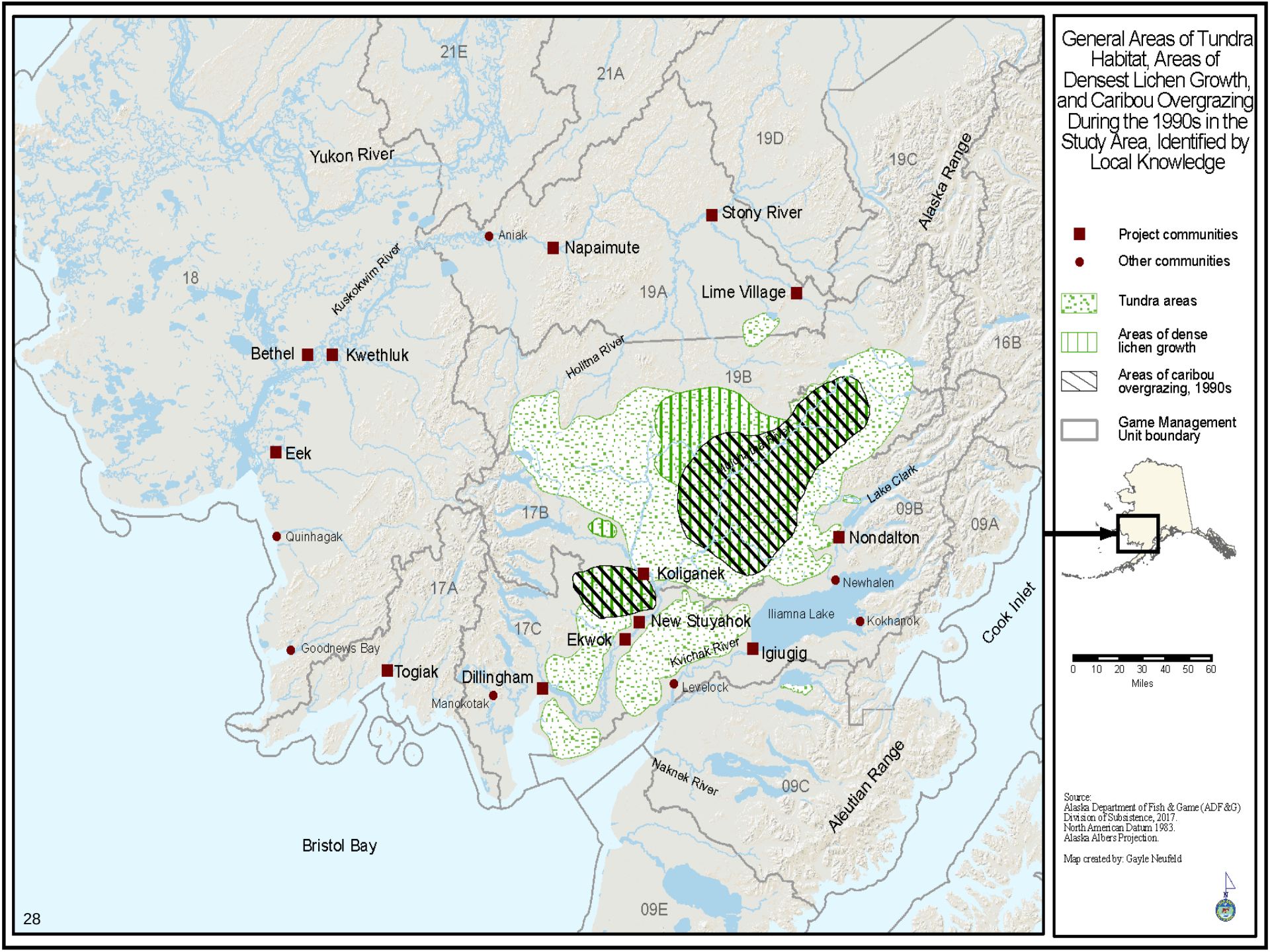
= a combination of factors:

- Overgrazing
- Disease
- Lowered reproduction
- Liberalized hunting during the 1980s-1990s
- Predation

"For about ten years they were [abundant] and then all of a sudden they started declining, and then they just moved over to the other side [Kuskowkim River GMU 18]. I'd never seen that many caribou, there were too many. They got so big they ate up all the lichen. They overgrazed and they got some kind of hoof disease." Koliganek respondent

"It was [easy hunting] during 70s, 80s, 90s, then 2000 all of a sudden they disappeared. We used to only have to go 30 miles, sometimes even 5 miles to get caribou, but not anymore. What they did was, they went over towards Shotgun Hills, over towards the Bethel area, towards the west." Koliganek respondent

"When they poured into the country…it was like a dream." Napaimute respondent


General Areas of Tundra Habitat, Areas of Densest Lichen Growth, and Caribou Overgrazing During the 1990s in the Study Area, Identified by Local Knowledge
Project communities
Other communities
Tundra areas
Areas of dense lichen growth
Areas of caribou overgrazing, 1990s
Game Management Unit boundary
0 10 20 30 40 50 60
Miles
Source:
Alaska Department of Fish & Game (ADF&G) Division of Subsistence, 2017.
North American Datum 1983.
Alaska Albers Projection.
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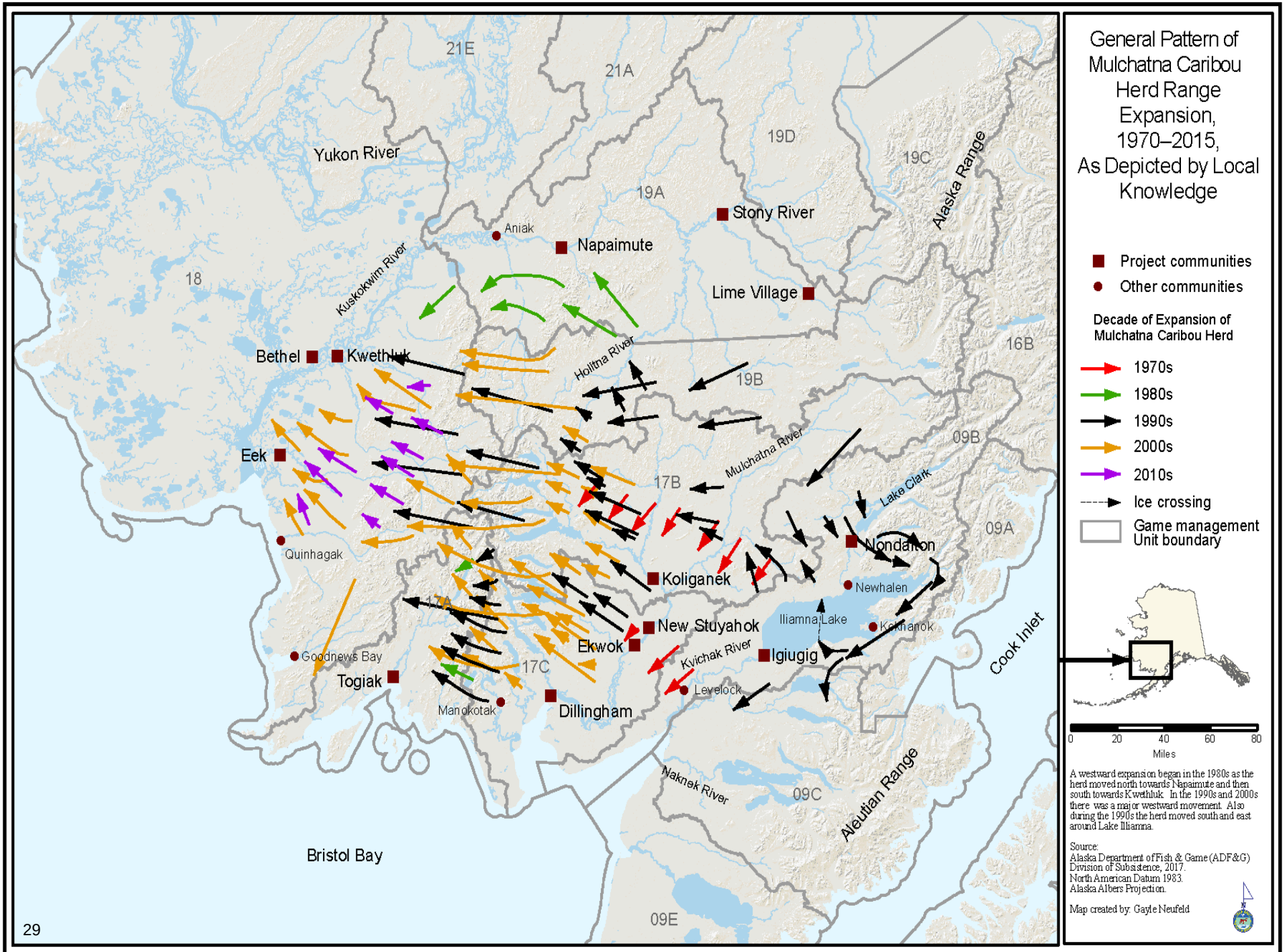
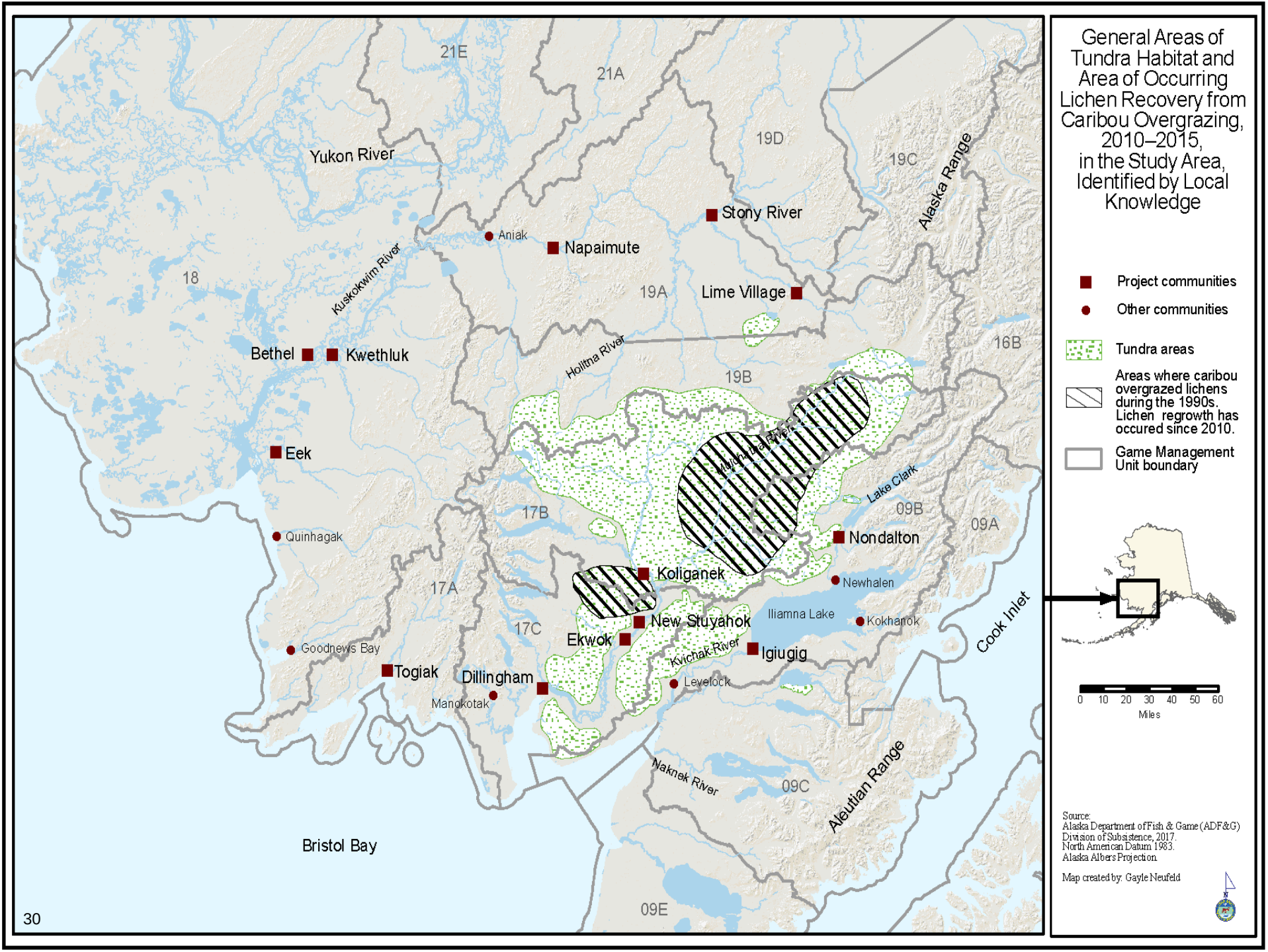
Iliamna Lake
Kokhanok
New Stuyahok
17C
Ekwok
Cook Inlet
Goodnews Bay
Kvichak River
Igiugig
Togiak
Dillingham
Levelock
Manokotak
Naknek River
09C
Aleutian Range
Bristol Bay
09E
28


General Pattern of Mulchatna Caribou Herd Range Expansion, 1970–2015, As Depicted by Local Knowledge
Project communities
Other communities
Decade of Expansion of Mulchatna Caribou Herd
1970s
1980s
1990s
2000s
2010s
Ice crossing
Game management Unit boundary
0 20 40 60 80
Miles
A westward expansion began in the 1980s as the herd moved north towards Napaimute and then south towards Kwethluk. In the 1990s and 2000s there was a major westward movement. Also during the 1990s the herd moved south and east around Lake Iliamna.
Source:
Alaska Department of Fish & Game (ADF&G) Division of Subsistence, 2017.
North American Datum 1983.
Alaska Albers Projection.
Map created by: Gayle Neufeld
21E
21A
19D
19C
19A
19B
18
16B
09B
09A
17B
17A
17C
09C
09E
Yukon River
Kuskokwim River
Holitna River
Mulchatna River
Lake Clark
Alaska Range
Aleutian Range
Naknek River
Kvichak River
Cook Inlet
Bristol Bay
Aniak
Napaimute
Stony River
Lime Village
Bethel
Kwethluk
Eek
Quinhagak
Goodnews Bay
Togiak
Manokotak
Dillingham
Koliganek
New Stuyahok
Ekwok
Levelock
Igiugig
Iliamna Lake
Newhalen
Kokhanok
Nondalton


General Areas of Tundra Habitat and Area of Occurring Lichen Recovery from Caribou Overgrazing, 2010–2015, in the Study Area, Identified by Local Knowledge
Project communities
Other communities
Tundra areas
Areas where caribou overgrazed lichens during the 1990s. Lichen regrowth has occured since 2010.
Game Management Unit boundary
0 10 20 30 40 50 60
Miles
Source:
Alaska Department of Fish & Game (ADF&G)
Division of Subsistence, 2017.
North American Datum 1983.
Alaska Albers Projection.
Map created by: Gayle Neufeld
21E
21A
19D
19C
Alaska Range
Yukon River
Stony River
Aniak
Napaimute
Kuskokwim River
18
19A
Lime Village
16B
Bethel
Kwethluk
Holitna River
19B
Eek
Kuskokwim River
Lake Clark
09B
09A
17B
Quinhagak
Nondalton
Koliganek
Newhalen
17A
New Stuyahok
Iliamna Lake
Kokhanok
17C
Ekwok
Kvichak River
Igiugig
Cook Inlet
Goodnews Bay
Togiak
Dillingham
Levelock
Manokotak
Naknek River
09C
Aleutian Range
Bristol Bay
09E
30

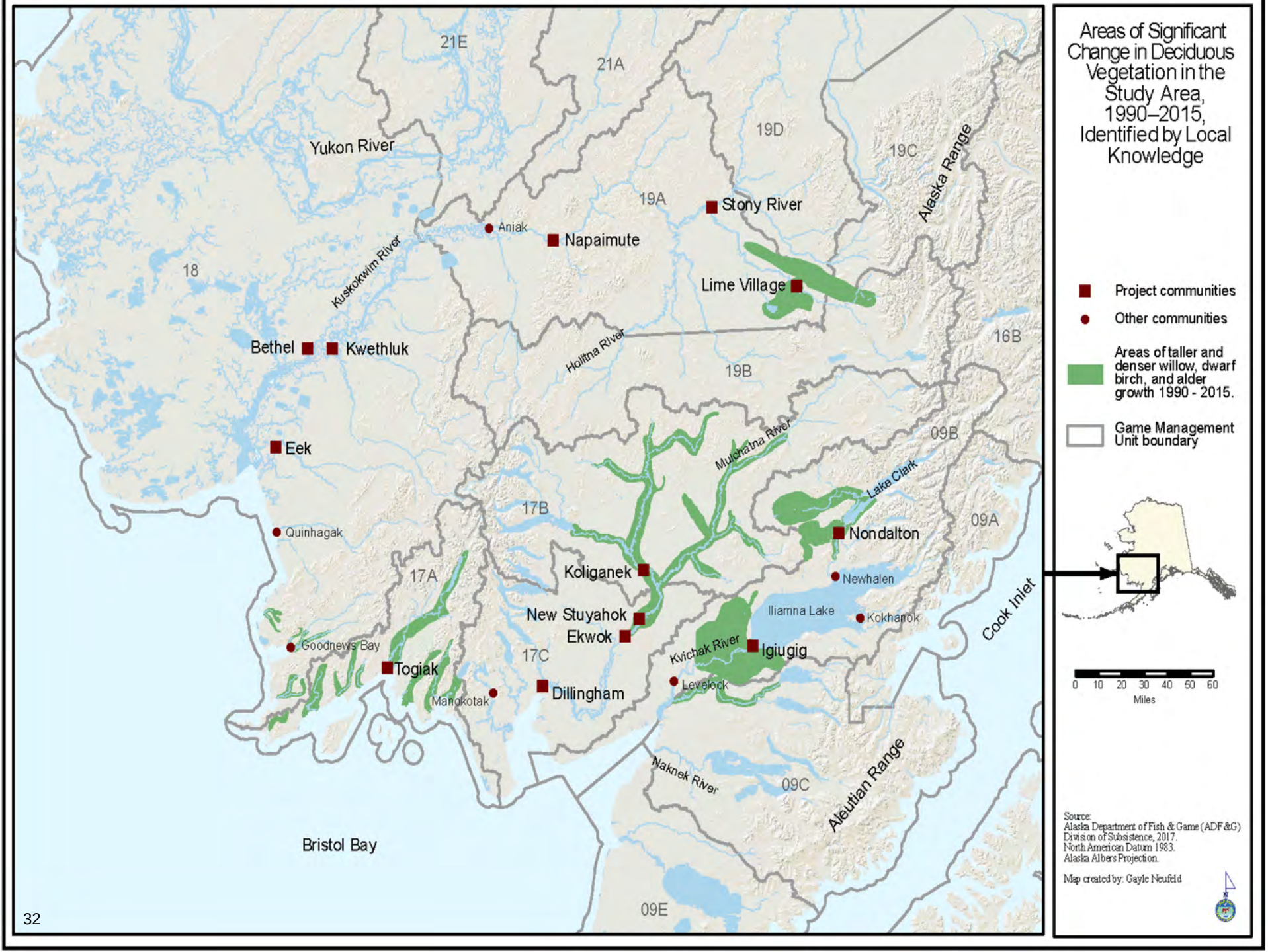
Local Knowledge of Vegetation Change

“Today it is much more brushy than during all of my previous lifetime. Especially along the rivers and on the sandbars that did not used to have trees, you can’t even walk through them now.”
Togiak elder

“More brushy all over. The last twenty years there is more brush. Up river, all over…It has gotten warmer and the brushes grow more. Up the river we never used to see brushes in the sandbars but now they're all over. I see that. Not just the sandbars but along the creeks.” Koliganek respondent

“It’s gotten more brushy because of this warm weather and not as harsh of winters, the trees are growing better.”
Igiugig elder

“[The] grass and leaves are now staying green longer than normal [and] sometimes in winter we’ve seen green, especially in the places where it hardly freezes…When it stays warm all of sudden the grass grows back up.”
Togiak elder


Areas of Significant Change in Deciduous Vegetation in the Study Area, 1990–2015, Identified by Local Knowledge
Project communities
Other communities
Areas of taller and denser willow, dwarf birch, and alder growth 1990 - 2015.
Game Management Unit boundary
0 10 20 30 40 50 60
Miles
Source:
Alaska Department of Fish & Game (ADF&G) Division of Subsistence, 2017.
North American Datum 1983.
Alaska Albers Projection.
Map created by: Gayle Neufeld
21E
21A
19D
19C
19A
18
19B
16B
09B
17B
09A
17A
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09C
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Yukon River
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Koliganek
New Stuyahok
Ekwok
Levelock
Igiugig
Iliamna Lake
Newhalen
Kokhanok
Nondalton

Local Knowledge = Caribou habitat not significantly altered:

"I don't think the new brush had much anything to do with the caribou herd crash." Koliganek elder

"There is a lot of open tundra country in the upper Nushagak [river area].This whole area, east and west, is still all open, nothing has really changed as far as forest, it's the same tundra." Dillingham respondent

"We don't really have so much brush that it is really changing the tundra…the sloughs and river sides have grown more and more large willows. The meadows have only changed a little bit." Igiugig elder

"Down towards the coast you can definitely notice that the habitat has changed a lot, but [upriver] tundra and moss have not changed, the country has stayed mostly open, the brush has not encroached everywhere. There is still plenty of nice tundra around here." Dillingham elder

Lower Mulchatna River
2017

Local Knowledge = primary influence of vegetation change in subsistence-large-land-mammal-system:

- **increased moose abundance**
- **increased moose harvest opportunity**

"Starting during the 2000s a lot of the moose were moving down river, down the Mulchatna heading south towards the coastal areas. Now all the moose are way down in the Dillingham area." Nondalton Respondent

"We've got lots of moose. Moose have become a lot more abundant. Now you can probably get a moose…but it's much harder to get a caribou." Dillingham hunter

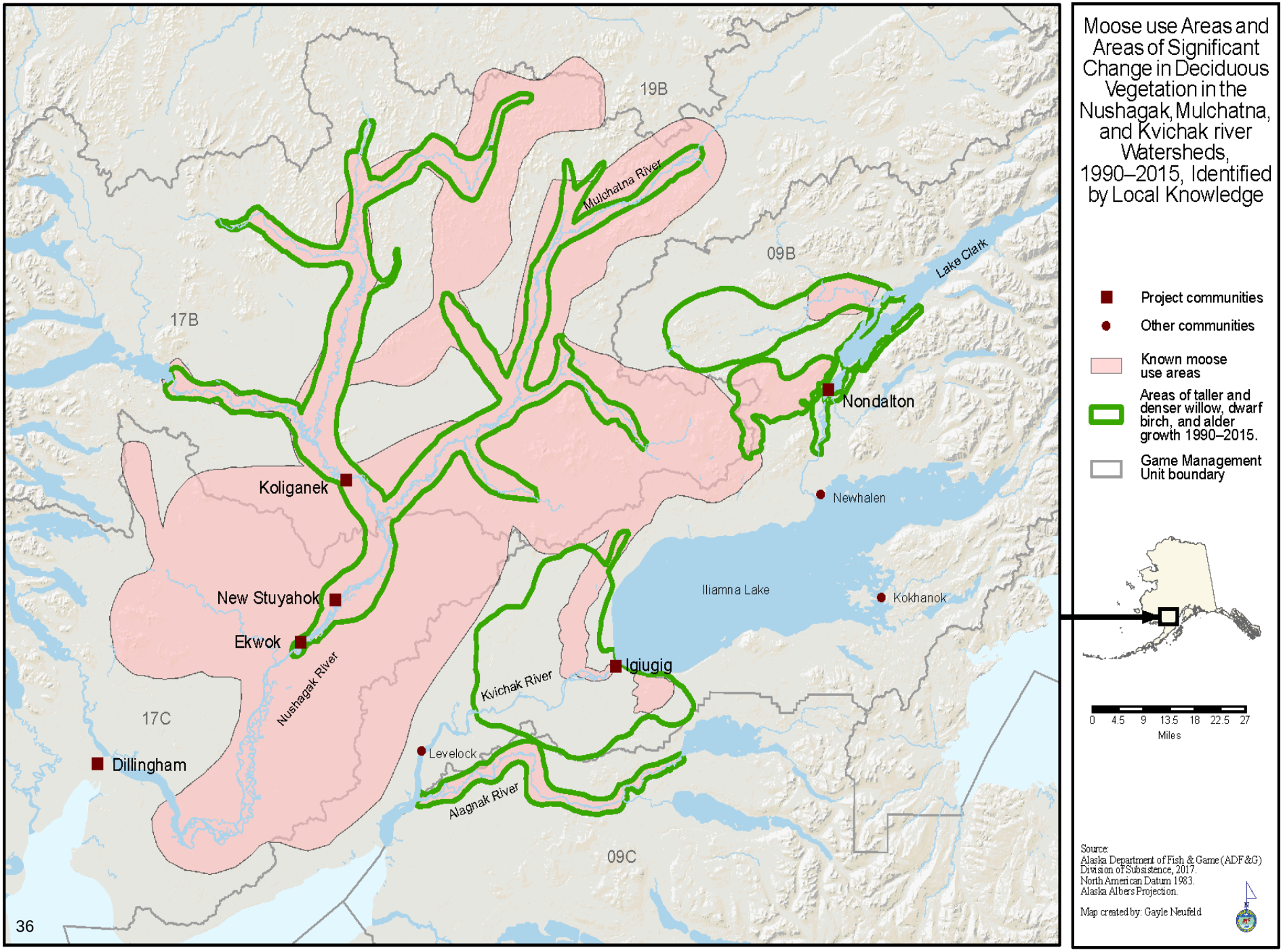
"[The elders just used to talk about moose, [there was] not too much moose, but they used to see a couple of moose. But nowadays there's a million moose." *Eek hunter*

Local Knowledge — Moose and Willow Dynamics

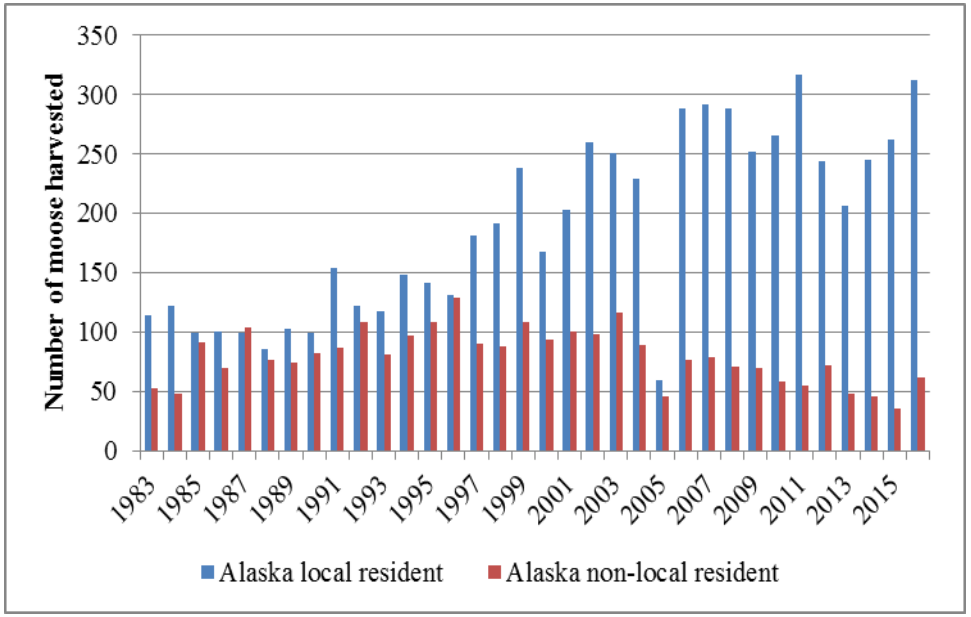
“The moose population is still growing well now. Fifteen to twenty years ago it started growing. It went from almost zero to 600, partly because of the new feed from all the growing willows and also because we stopped hunting out of season and stopped hunting for cow moose.” Togiak elder

“moose have been increasing because of the warm winters, there is better willows for feeding. Moose like to eat willows. Up sloughs and along the banks of the rivers is good feed for em.” Igiugig elder

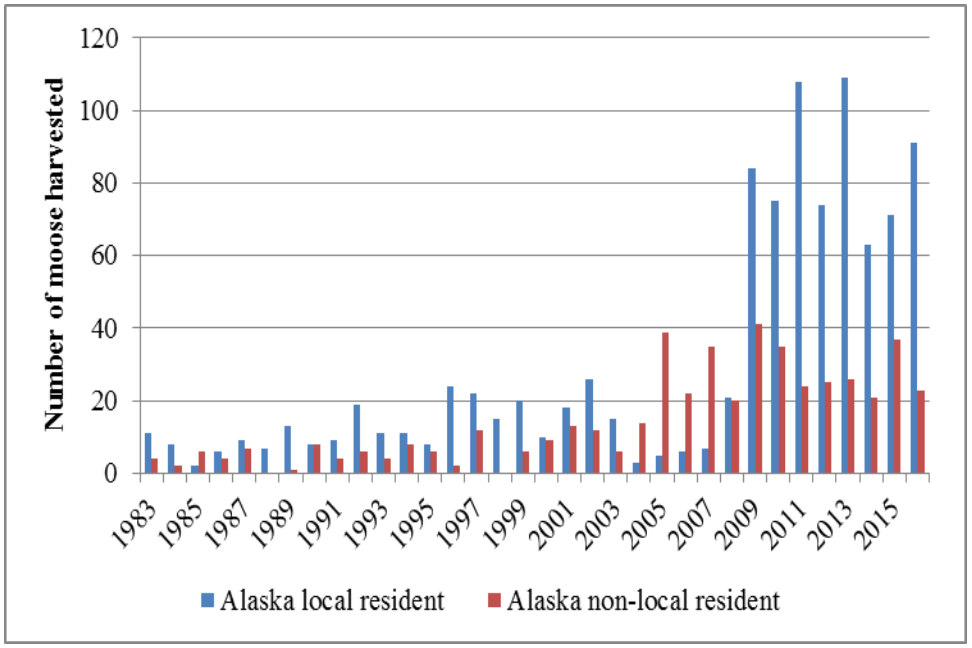
“If willows are growing bigger, then moose [populations] will also grow.” Dillingham hunter


Moose use Areas and Areas of Significant Change in Deciduous Vegetation in the Nushagak, Mulchatna, and Kvichak river Watersheds, 1990–2015, Identified by Local Knowledge
19B
09B
17B
17C
09C
Mulchatna River
Lake Clark
Nushagak River
Kvichak River
Alagnak River
Iliamna Lake
Nondalton
Newhalen
Kokhanok
Koliganek
New Stuyahok
Ekwok
Igiugig
Levelock
Dillingham
Project communities
Other communities
Known moose use areas
Areas of taller and denser willow, dwarf birch, and alder growth 1990–2015.
Game Management Unit boundary
0 4.5 9 13.5 18 22.5 27
Miles
Source:
Alaska Department of Fish & Game (ADF&G)
Division of Subsistence, 2017.
North American Datum 1983.
Alaska Albers Projection.
Map created by: Gayle Neufeld

Reported Moose Harvests by Alaska Residents in GMUs 17 & 9B-C 1983–2016



Reported Moose Harvests by Alaska Residents in GMU 18 1983–2016



Source: ADF&G (Alaska Department of Fish and Game). WinfoNet. Unpublished internal database

Hunter Adaptation — Access

- Distance
- Winter Conditions

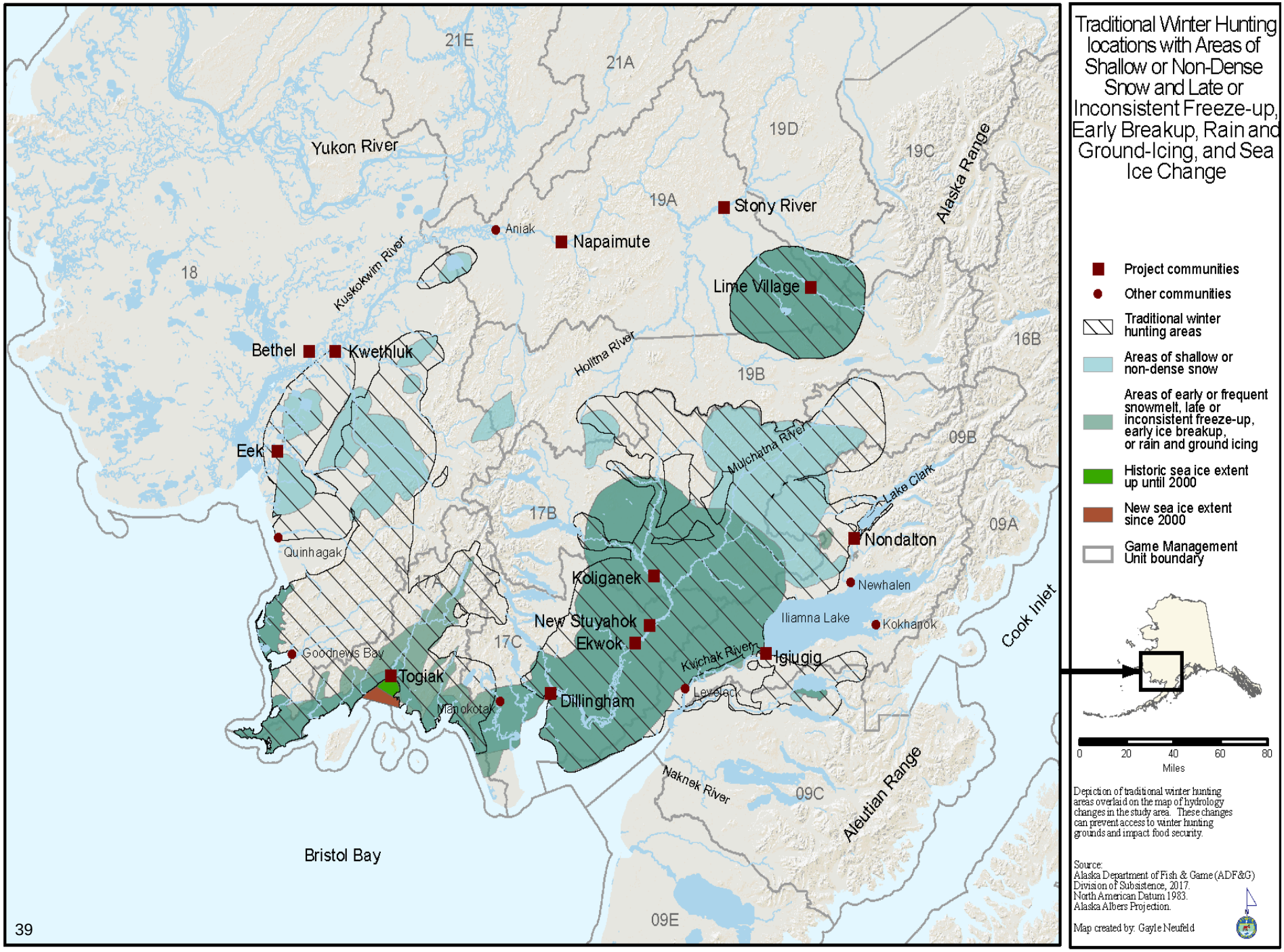
  Late Freeze-up
  Early Break-up
  Mild/Warmer Winters
  Less Snow
  Rain-on-snow

“For the last four years we didn’t go winter hunting because the weather is too warm, too dangerous to cross rivers.”
Kolignaek elder

Today we can’t travel in winter like we used to, there is always open water in creeks and lakes, it’s not freezing up.”
Nondalton elder

“There’s not enough snow to access caribou the last few winters. You gotta have an airplane to get to the caribou.”
Ekwok elder

“With the lack of snow, we’ve been relegated to only hunting caribou with skiffs in the fall. Winter hunts, [we] can’t get caribou now; no snow, no access, marginal snow conditions. Some years there has been barely enough snow, other years not enough…people got hardly any caribou . Also, the rivers have not been freezing so you cannot cross the [Wood] river to get at them. There can be snow, but if it’s warm and the rivers are not frozen it doesn’t matter if there’s snow.”
Dillingham Hunter


Traditional Winter Hunting locations with Areas of Shallow or Non-Dense Snow and Late or Inconsistent Freeze-up, Early Breakup, Rain and Ground-Icing, and Sea Ice Change
Project communities
Other communities
Traditional winter hunting areas
Areas of shallow or non-dense snow
Areas of early or frequent snowmelt, late or inconsistent freeze-up, early ice breakup, or rain and ground icing
Historic sea ice extent up until 2000
New sea ice extent since 2000
Game Management Unit boundary
0 20 40 60 80
Miles
Depiction of traditional winter hunting areas overlaid on the map of hydrology changes in the study area. These changes can prevent access to winter hunting grounds and impact food security.
Source:
Alaska Department of Fish & Game (ADF&G)
Division of Subsistence, 2017.
North American Datum 1983.
Alaska Albers Projection.
Map created by: Gayle Neufeld
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Ekwok
Levelock
Igiugig
Iliamna Lake
Newhalen
Nondalton
Kokhanok

Local Perspectives on Management and Regulations

Management and Regulations

- Importance of winter caribou and moose hunts
- Requires adequate snowfall

"The existing regs [hunting regulations] are fine, unless you could make it snow and freeze."
Dillingham hunter

Primary Adaptive Considerations of Subsistence Large Land Mammal Hunters:

- **Access**
- **Prey-Switching**

Questions and Comments?

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