



Photo: Dave Shaw

ECOLOGICAL ATLAS OF ALASKA'S WESTERN ARCTIC

Third Edition

Benjamin Sullender and Melanie Smith

July 2016

Ecological Atlas of Alaska's Western Arctic

Alaska's Western Arctic is arguably the wildest, most remote land area in the United States today. Alaska's North Slope Borough is similar in size to the State of California, yet has less than 10,000 residents. The area boasts extraordinary wild-life and is the home of Alaska Native people who have been present in the area for thousands of years. The coastal plain is one of the largest wetland complexes in the circumpolar Arctic, attracting a globally significant abundance of water-fowl, shorebirds, and raptors, earning the name "America's Bird Basket." Birds from the Western Arctic disperse along all four major flyways of North America, as well as to Asia and beyond. A cohort of iconic Arctic mammals gather here, including caribou, muskoxen, and polar bears. This is also an area of major oil, gas, and coal resources. Central to the region is the 23-million acre National Petroleum Reserve-Alaska (NPRA). The maps collected here help the reader explore the landscape, and better understand the overlap of wild-life, people, and development to inform conservation and management.

BACKGROUND OF THE ATLAS

Audubon Alaska published the first edition of this ecological atlas as part of the 2003 Western Arctic Synthesis, edited and published by John Schoen and Stan Senner. At the time, the use of GIS in conservation mapping was relatively new. Audubon contracted with EcoTrust and The Nature Conservancy to map spatial data across the Western Arctic. That set of maps was regarded as the first comprehensive spatial assessment of resource values for the region. The process brought a greater understanding of ecosystem patterns and important areas. As a result, places such as Teshekpuk Lake and Utukok Uplands drew the attention of many.

In 2009, Audubon used our in-house GIS capacity to collect the latest spatial data and update the set of maps. That

second edition was completed by Melanie Smith and Alan Baldivieso. Based on the updated spatial data, in 2011 Melanie Smith, Eric Myers, and John Schoen revised Audubon's Habitat Conservation Strategy for the NPRA, including new and revised recommendations for special areas and development restrictions. Those maps were influential to the Bureau of Land Management's 2013 management plan for the NPRA, speaking to the importance of investing in data and mapping as a key conservation tool.

This third edition was completed by Benjamin Sullender and Melanie Smith, with data support from Nathan Walker. It includes new datasets such as climate change projections, vegetation mapping, and future development scenarios. It also includes updated data such as Important Bird Areas, caribou habitat selection, pinniped distribution, and estimated oil resources. The process of developing an ecological atlas sheds light on landscape patterns and significant places. Some of the region's important areas are described below.



Photo: Gerrit Vyn

Photo: Gerrit Vyn

IMPORTANT AREAS

TESHEKPUK LAKE

The Teshekpuk Lake region is a globally-significant Important Bird Area for its very high density of many bird species of concern, such as Spectacled, Steller's, and King Eiders; Yellow-billed and Red-throated Loons; and Black Brant. The Teshekpuk Caribou Herd migrates to this area each year to calve their young and forage on abundant sedges. Geese gather in the tens of thousands in the fall to molt north of Teshekpuk Lake. A several-mile-wide coastal band is designated critical habitat for denning polar bears.

COLVILLE RIVER AND DELTA

The Colville River headwaters begin in the Brooks Range and the river ends over 300 miles downstream in a massive alluvial fan and delta plain stretching out toward the Beaufort Sea. The river itself marks an invisible but important boundary: a transition from the developed State of Alaska oil production lands to the federal NPRA which is just beginning to see its first oil production footprint. Known for its high density of raptors, the exposed Lower Cretaceous cliff banks of the Colville are tenanted by nesting Peregrine Falcons, Golden Eagles, Rough-legged Hawks, and Gyrfalcons. The delta is a globally-recognized Important Bird Area where a world-class gathering of shorebirds and waterfowl raise their chicks. Black Brant, Steller's Eiders, Stilt Sandpipers, and more than 60 other species breed there. Arctic foxes, muskoxen, wolves, caribou, and the occasional land-locked polar bear wander through the delta.

UTUKOK RIVER UPLANDS

These higher elevation foothills and uplands are the headwaters for the Utukok River as well as the Meade and Colville rivers. This excellent wolverine habitat has one of the highest densities of this hard-to-find species anywhere, as well as high densities of caribou, wolves, and grizzly bears. The uplands are the calving grounds of the Western Arctic Caribou Herd—the largest herd in Alaska. The area is also inhabited by moose, raptors, and anadromous fish.

DEASE INLET AND MEADE RIVER

The area around Dease Inlet and the Meade River is characterized by thousands of small thaw lakes, which are important habitat for nesting loons, waterfowl, and shorebirds. The inlet itself is home to ice seals, particularly ringed and spotted seals. The barrier islands are important for polar bears and nesting seabirds. The area also provides important insect

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maps in six chapters: Physical Setting, Biological Setting, Fish, Birds, Mammals, and Human Uses.

FOR MORE INFORMATION

Contact Authors: Benjamin Sullender and Melanie Smith, 907-276-7034 or bsullender@audubon.org

Related Report: Alaska's Western Arctic: A Summary and Synthesis of Resources (Schoen and Senner, eds. 2003)

On the Web: <http://ak.audubon.org/conservation/western-arctic-national-petroleum-reserve-alaska>

relief habitat for the Teshekpuk Caribou Herd. This area includes the densest Yellow-billed Loon nesting area in Alaska.

KASEGALUK LAGOON

Kasegaluk Lagoon is a highly productive shallow coastal lagoon and barrier island system spanning 125 miles of the Chukchi Sea coast. This is a very important area for coastal marine mammals and nesting, staging, and migrating waterbirds. Belugas whales calve and molt in the lagoon, and up to 35,000 walrus haul out near Point Lay.

IKPIKPUK RIVER

The Ikpiuk and its tributary, the Titaluk River, host a high density of nesting Peregrine Falcons. The Ikpiuk River is an anadromous fish stream and also has been identified as providing significant shorebird habitat. The delta of the Ikpiuk is an important nesting area for snow geese.

PEARD BAY

Peard Bay and the surrounding wetland complex is a concentration area for three species of ice seals, polar bears, and various seabirds—particularly eiders. The habitat adjacent to Peard Bay is characterized by thousands of small thaw lakes, which provide important habitat for nesting loons, waterfowl, and shorebirds.

DELONG MOUNTAINS AND ARCTIC FOOTHILLS

The DeLong Mountains and Arctic Foothills are heavily used by migrating caribou, grizzly bears, wolves, and wolverines. This area adjoins the Noatak National Preserve and the Gates of the Arctic National Park, and is an important component for maintaining an undeveloped ecological corridor from interior Alaska, across the Brooks Range, to the Arctic Coastal Plain.

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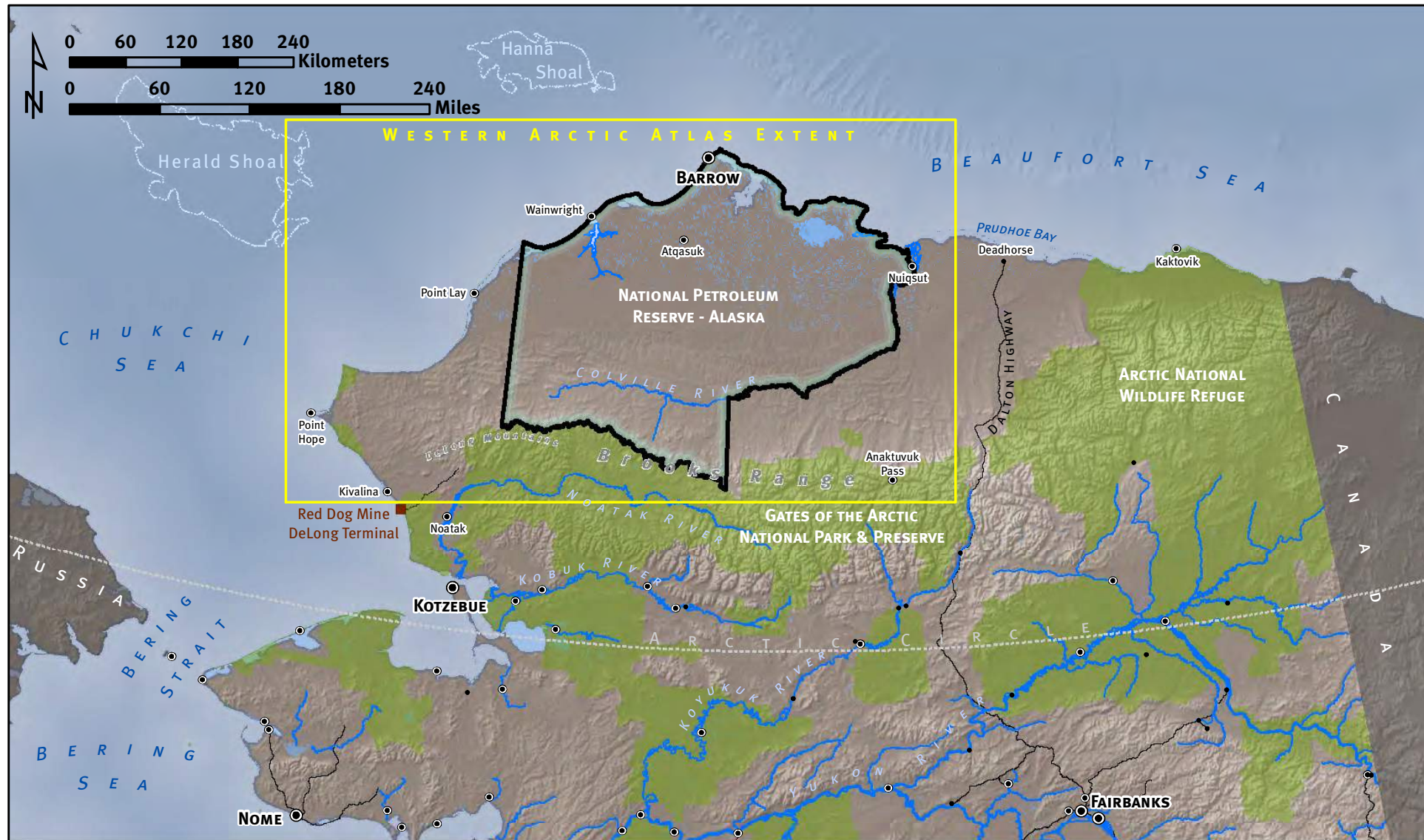
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REFERENCES

Suggested citation:

Sullender, B. K. and M. A. Smith. 2016. Ecological Atlas of Alaska's Western Arctic. Audubon Alaska, Anchorage, AK. 71 pp.

C O N T E X T



 NPRA BOUNDARY

 MAJOR RIVERS

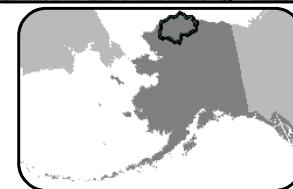
 NATIONAL PARKS AND
WILDLIFE REFUGES

 MAJOR ROADS

TOWNS

POPULATION

- < 100
- 100 - 999
- > 1,000



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PLACE NAMES AND GEOGRAPHY



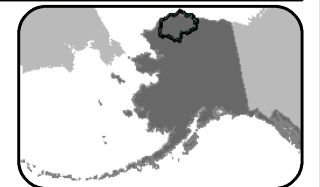
T O P O G R A P H Y



● TOWNS

NPRA BOUNDARY

~~~~~ MAJOR RIVERS

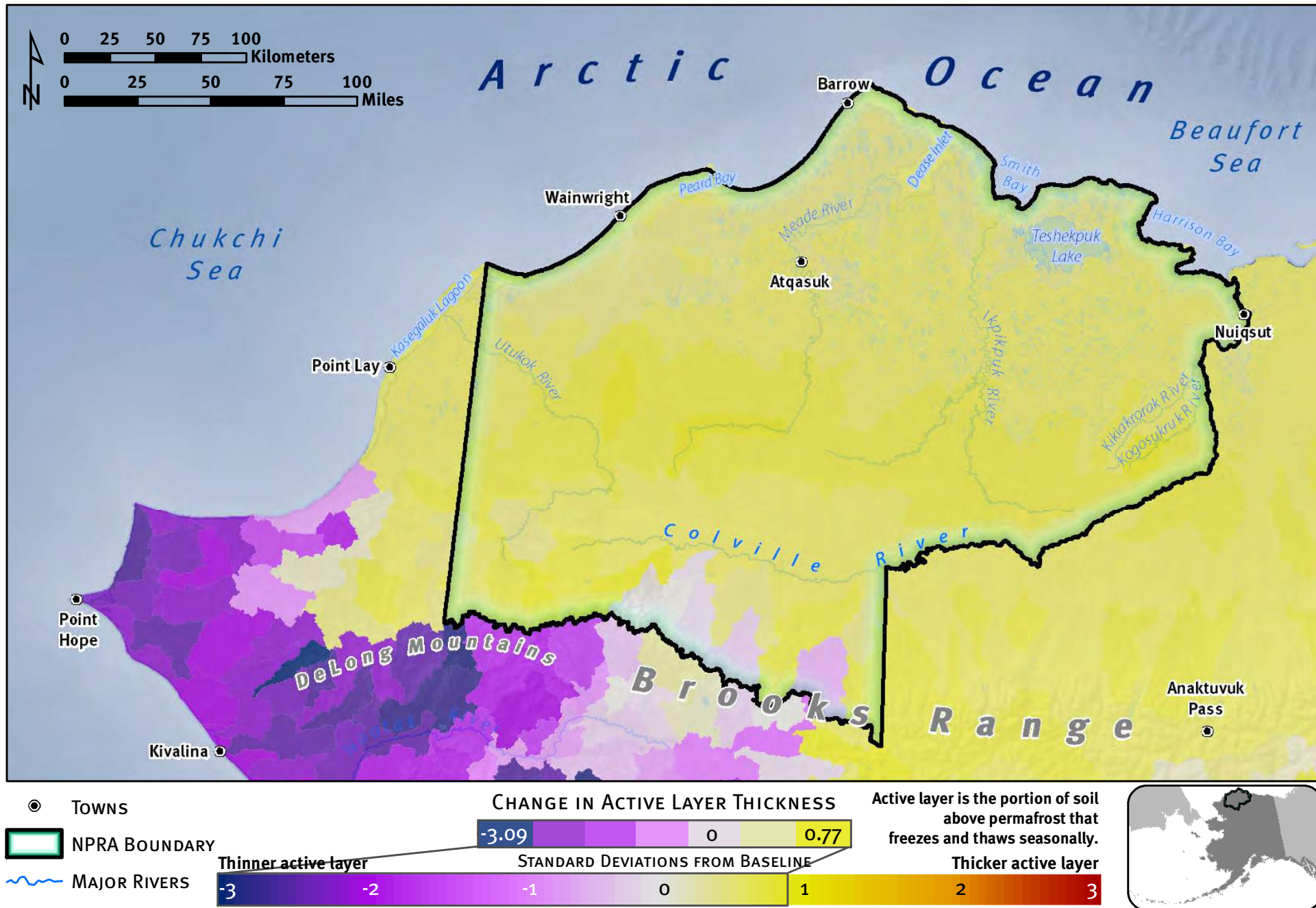


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# TERRESTRIAL CLIMATE CHANGE

## ACTIVE LAYER THICKNESS

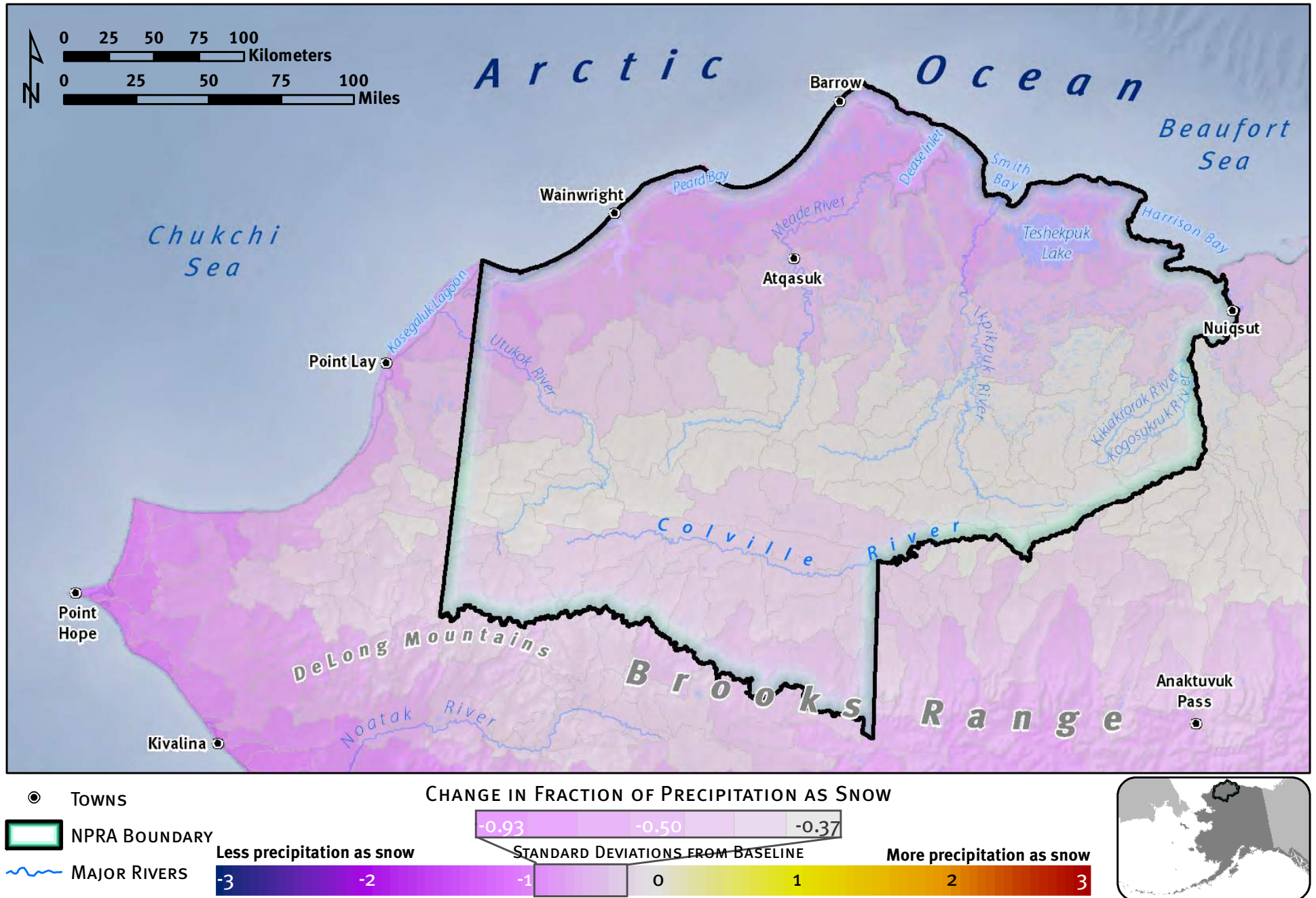


Sources: Smith and Walker 2014, based on Romanovsky and Marchenko 2014.

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# TERRESTRIAL CLIMATE CHANGE

## FRACTION OF PRECIPITATION FALLING AS SNOW



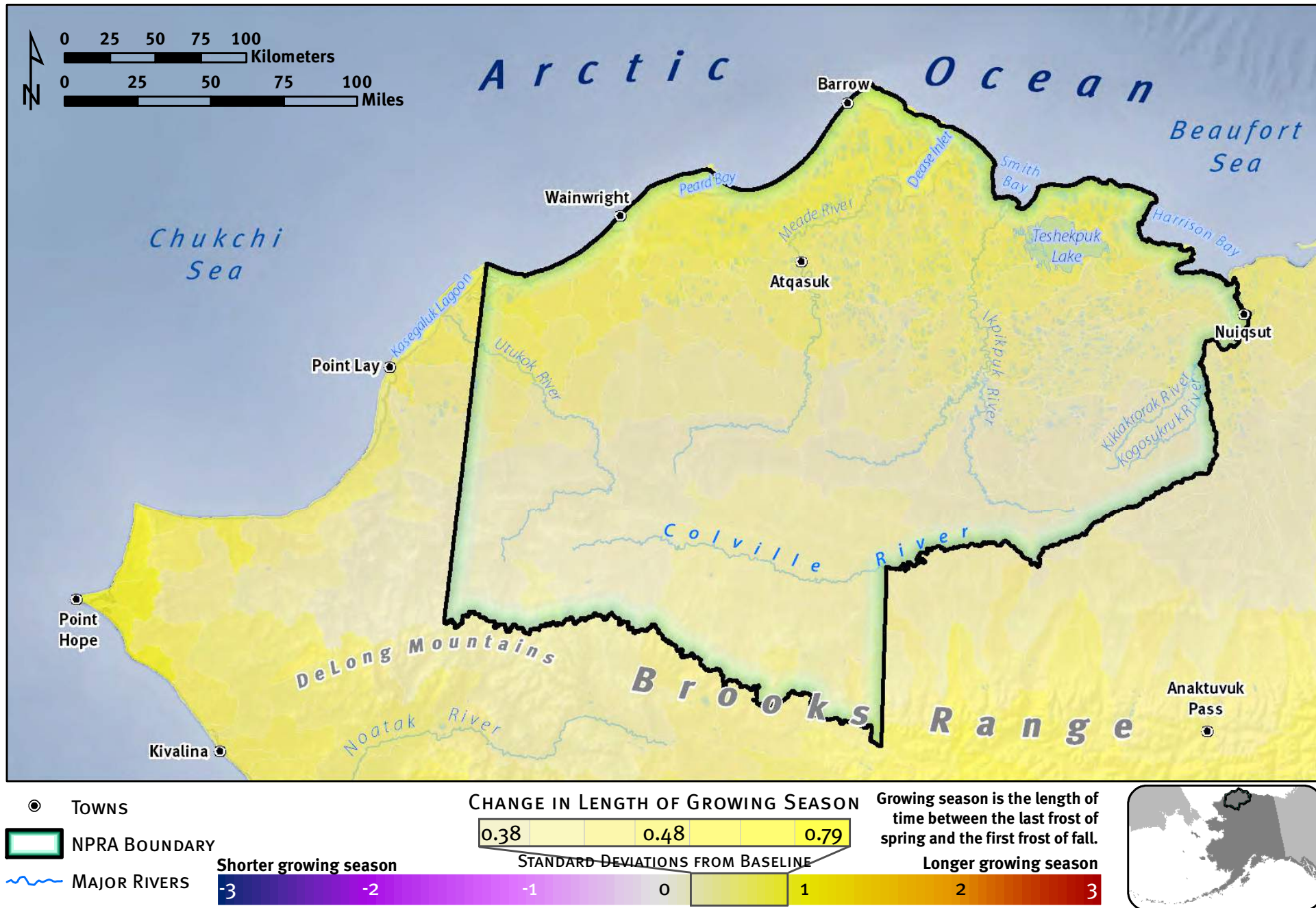
Sources: Smith and Walker 2014, based on SNAP 2013.

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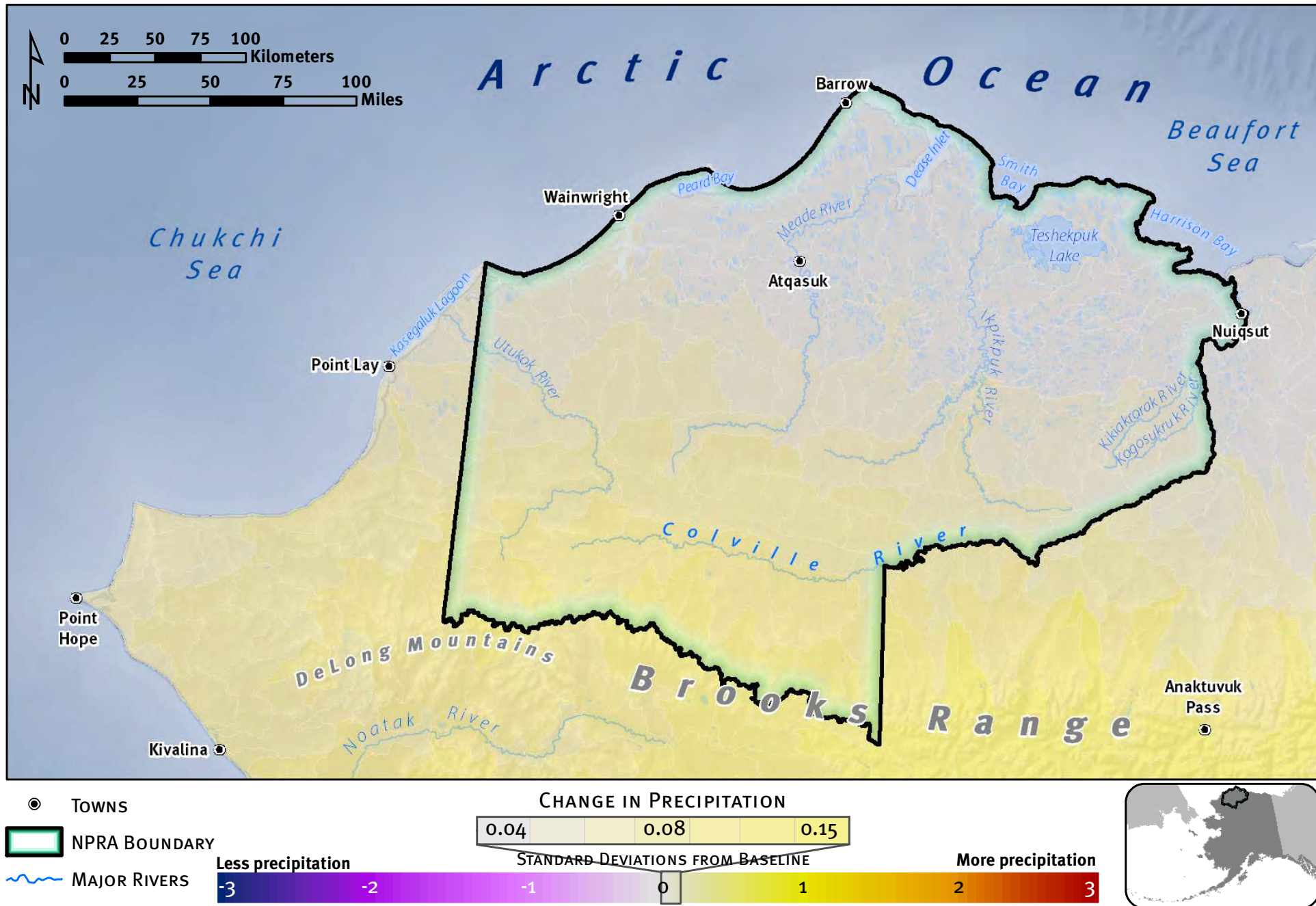
# TERRESTRIAL CLIMATE CHANGE

## LENGTH OF GROWING SEASON



Sources: Smith and Walker 2014, based on SNAP 2013.

# TERRESTRIAL CLIMATE CHANGE PRECIPITATION



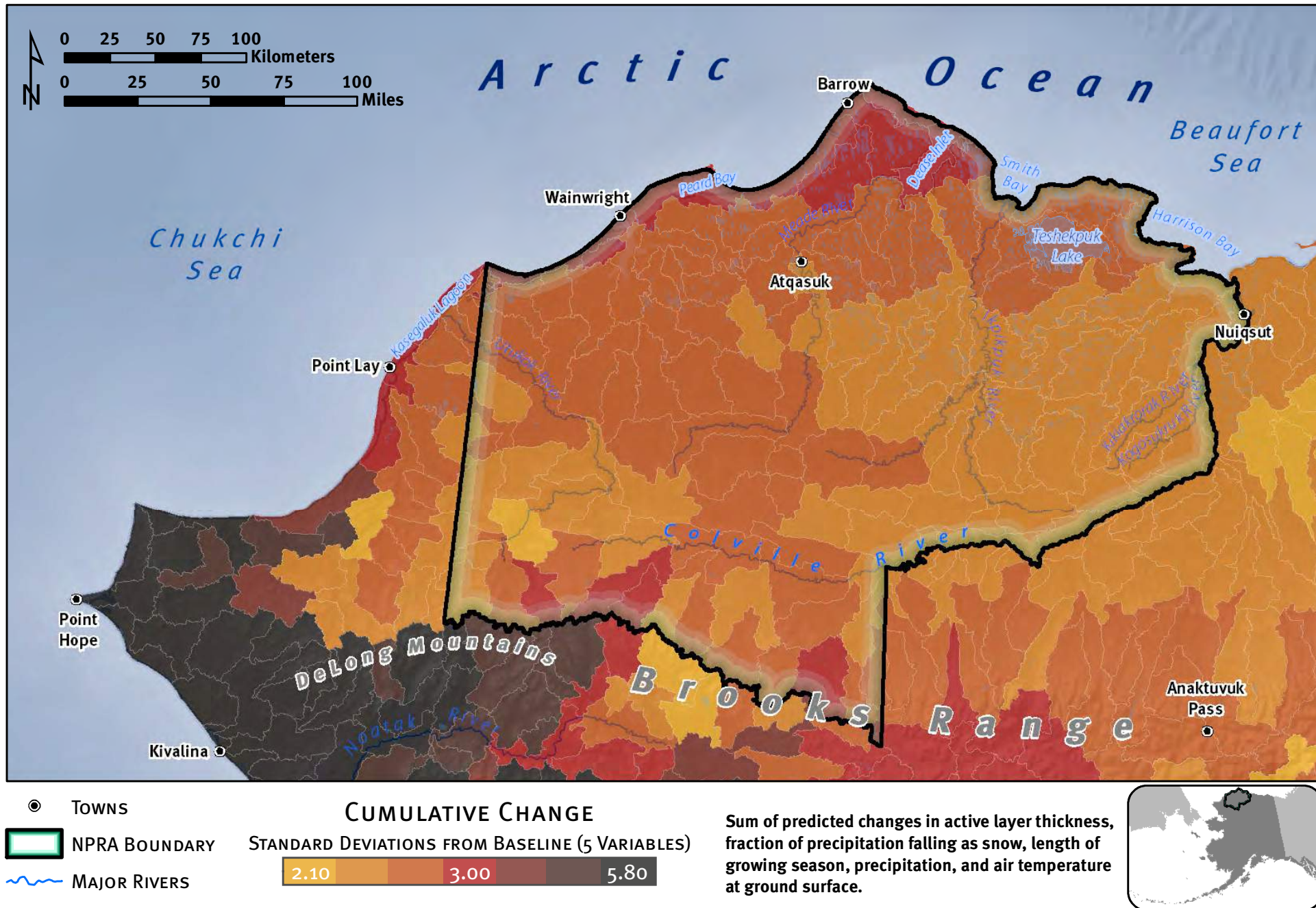
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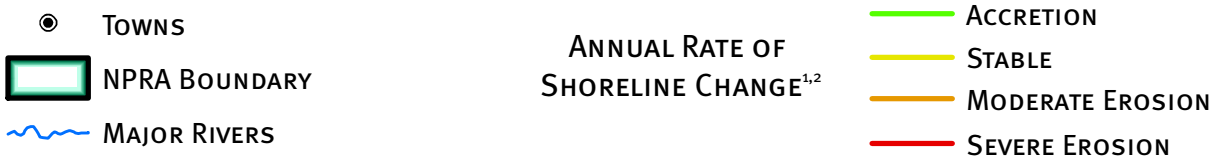
# TERRESTRIAL CLIMATE CHANGE CUMULATIVE VULNERABILITY



Sources: Smith and Walker 2014, based on SNAP 2013 and Romanovsky and Marchenko 2014.



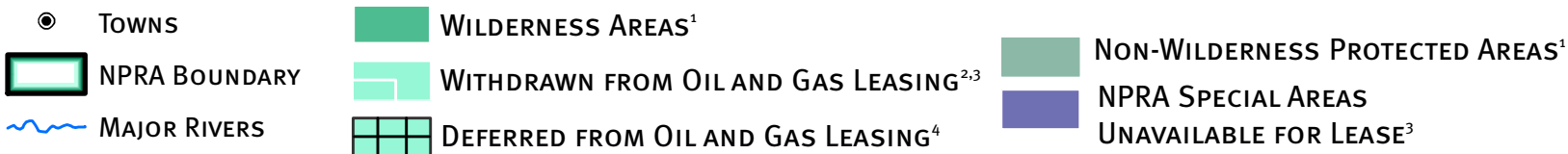
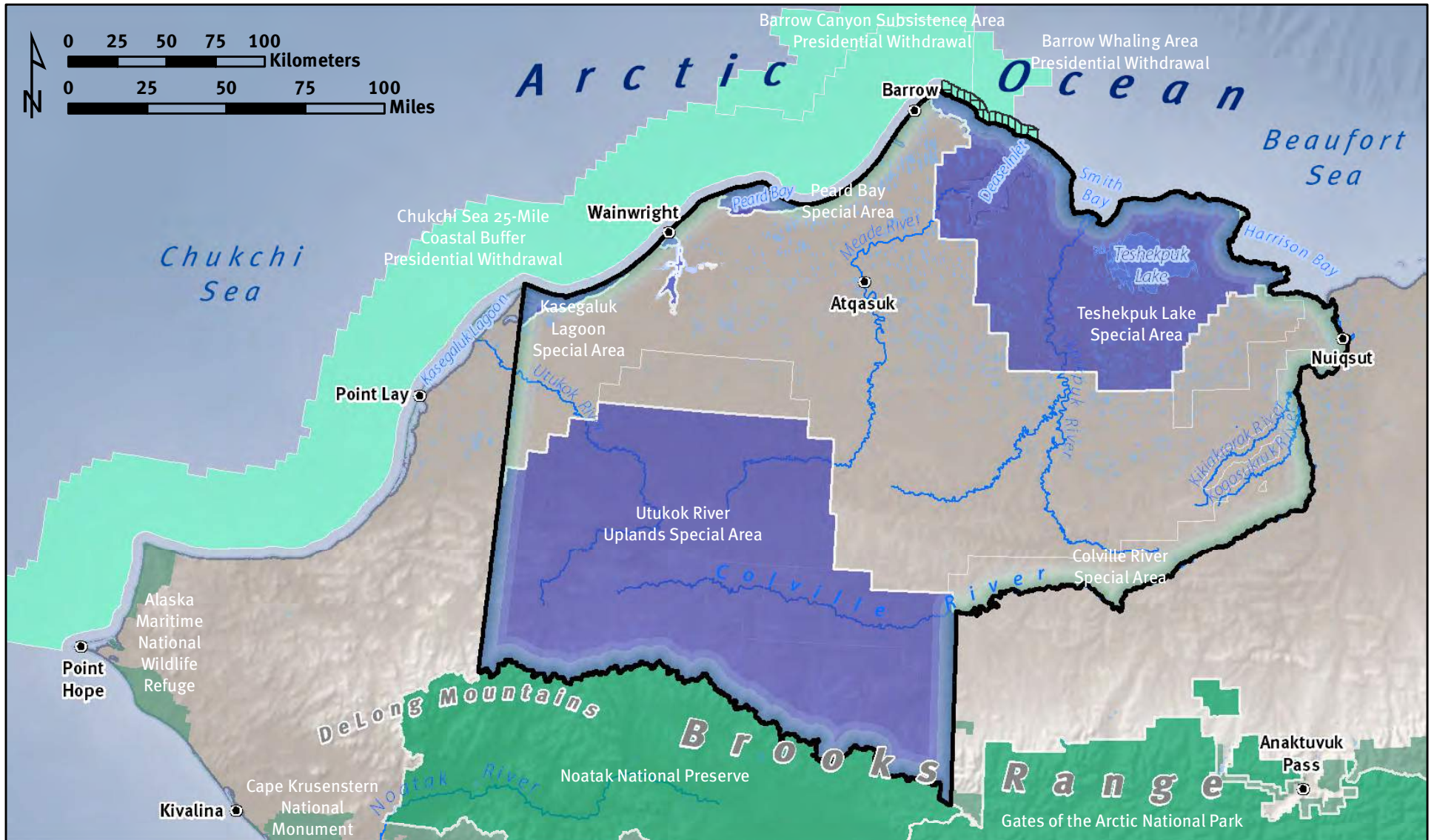
# C O A S T A L E R O S I O N



Sources: 1) Gibbs et al. 2015; 2) Gutierrez et al. 2014.

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# CONSERVATION AREAS

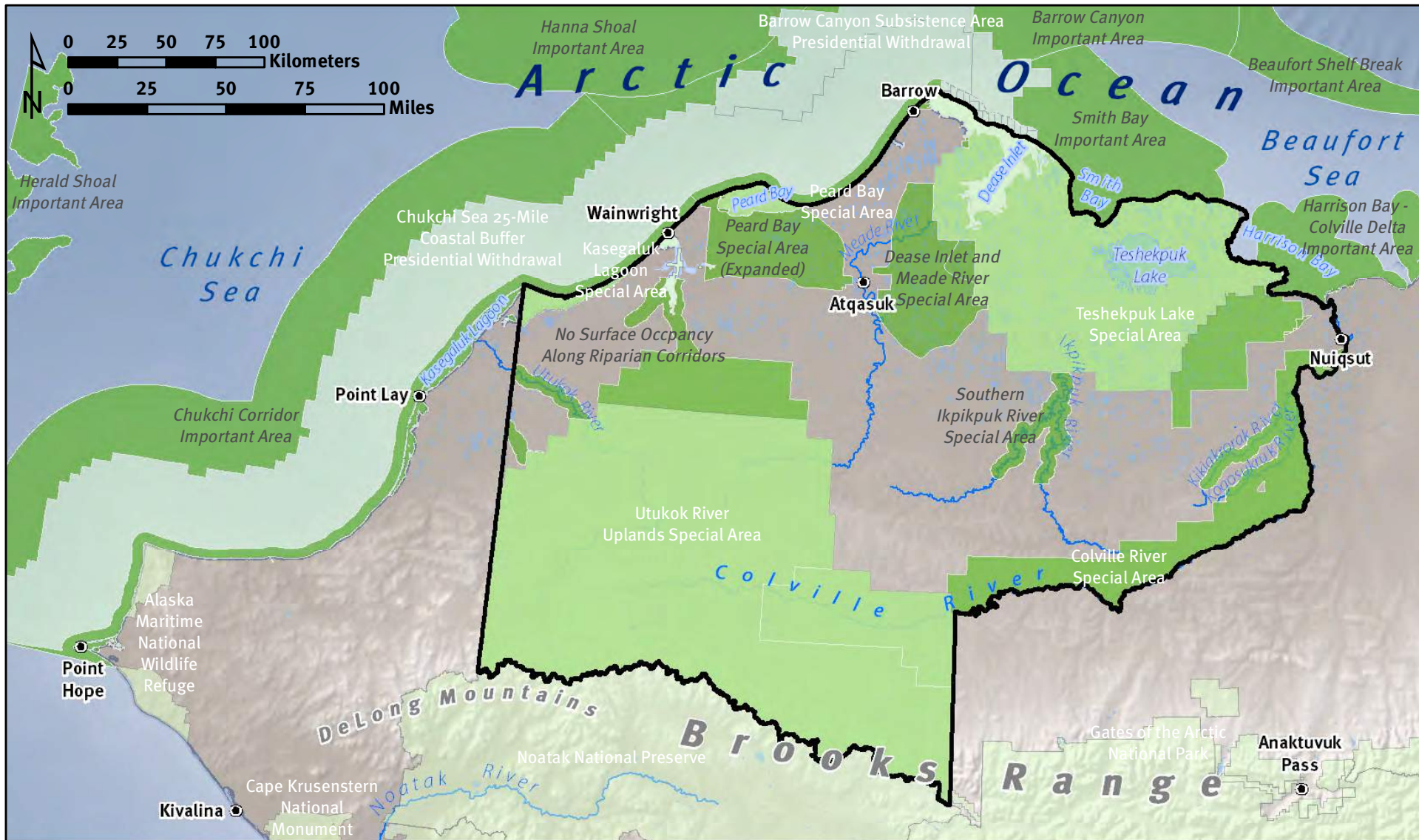


Sources: 1) University of Montana 2015; 2) BOEM 2015; 3) BLM 2013; 4) Alaska DNR 2015.

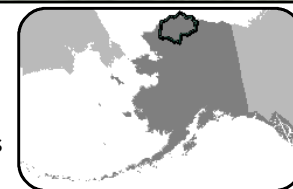
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# CONSERVATION PRIORITIES



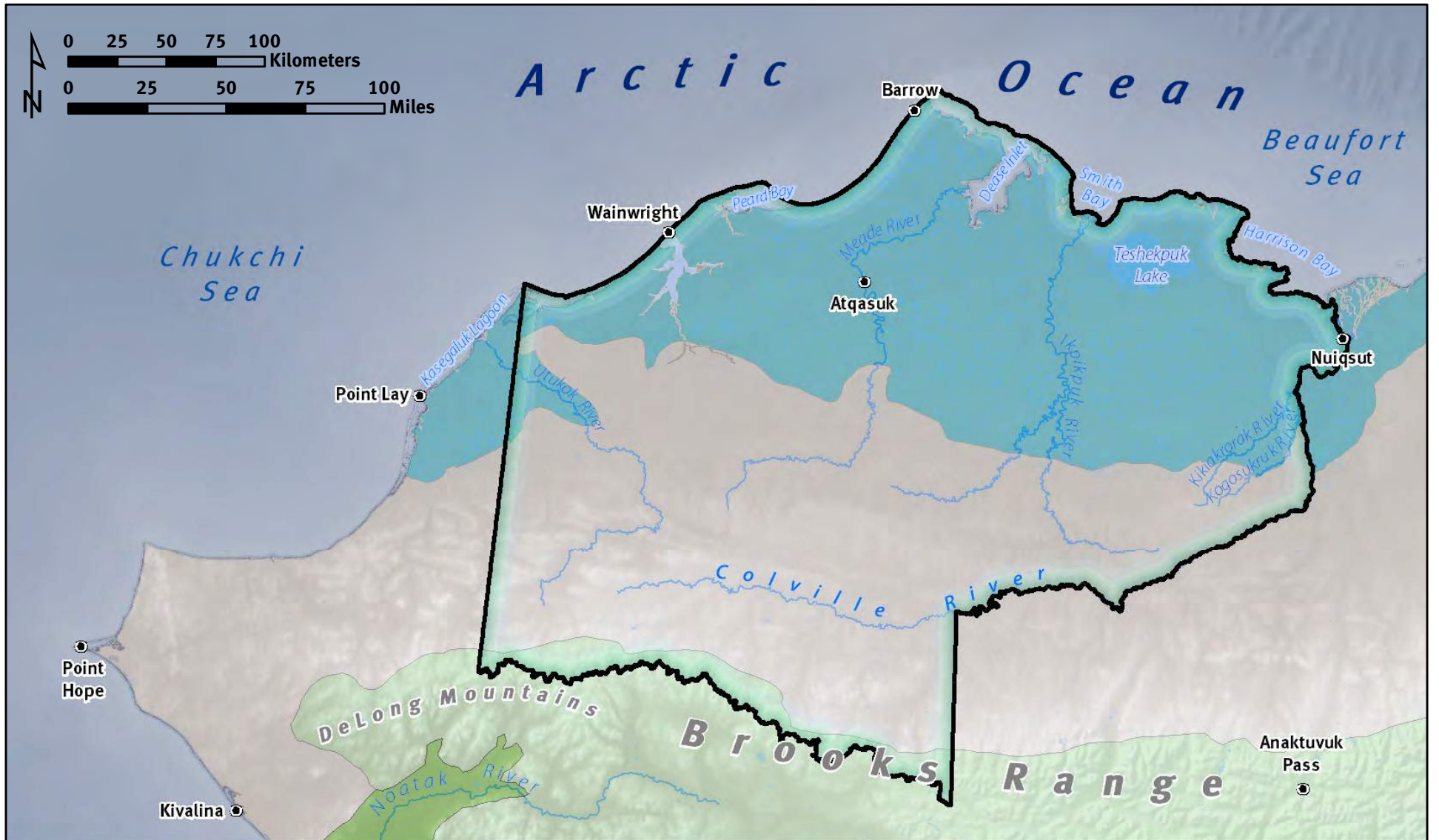
- TOWNS  
 ■ NPRA BOUNDARY  
 ~ MAJOR RIVERS
- BIOLOGICALLY IMPORTANT AREAS LACKING PROTECTION**  
 INCLUDES IMPORTANT AREAS IN THE ARCTIC OCEAN<sup>1</sup> AND PROPOSED NPRA SPECIAL AREAS / DEVELOPMENT RESTRICTIONS<sup>2</sup>
- AREAS WITH SOME LEVEL OF PROTECTION OR ADMINISTRATIVE RECOGNITION<sup>3,4,5,6</sup>**  
 INCLUDES NPRA SPECIAL AREAS<sup>3</sup>, AREAS WITHDRAWN FROM OIL AND GAS LEASING<sup>4</sup>, AREAS DEFERRED FROM OIL AND GAS LEASING<sup>5</sup>, AND NATIONAL PARKS<sup>6</sup>



Sources: 1) Audubon Alaska 2016; 2) Audubon Alaska 2011; 3) BLM 2013; 4) BOEM 2015; 5) Alaska DNR 2015; 6) University of Montana 2015.

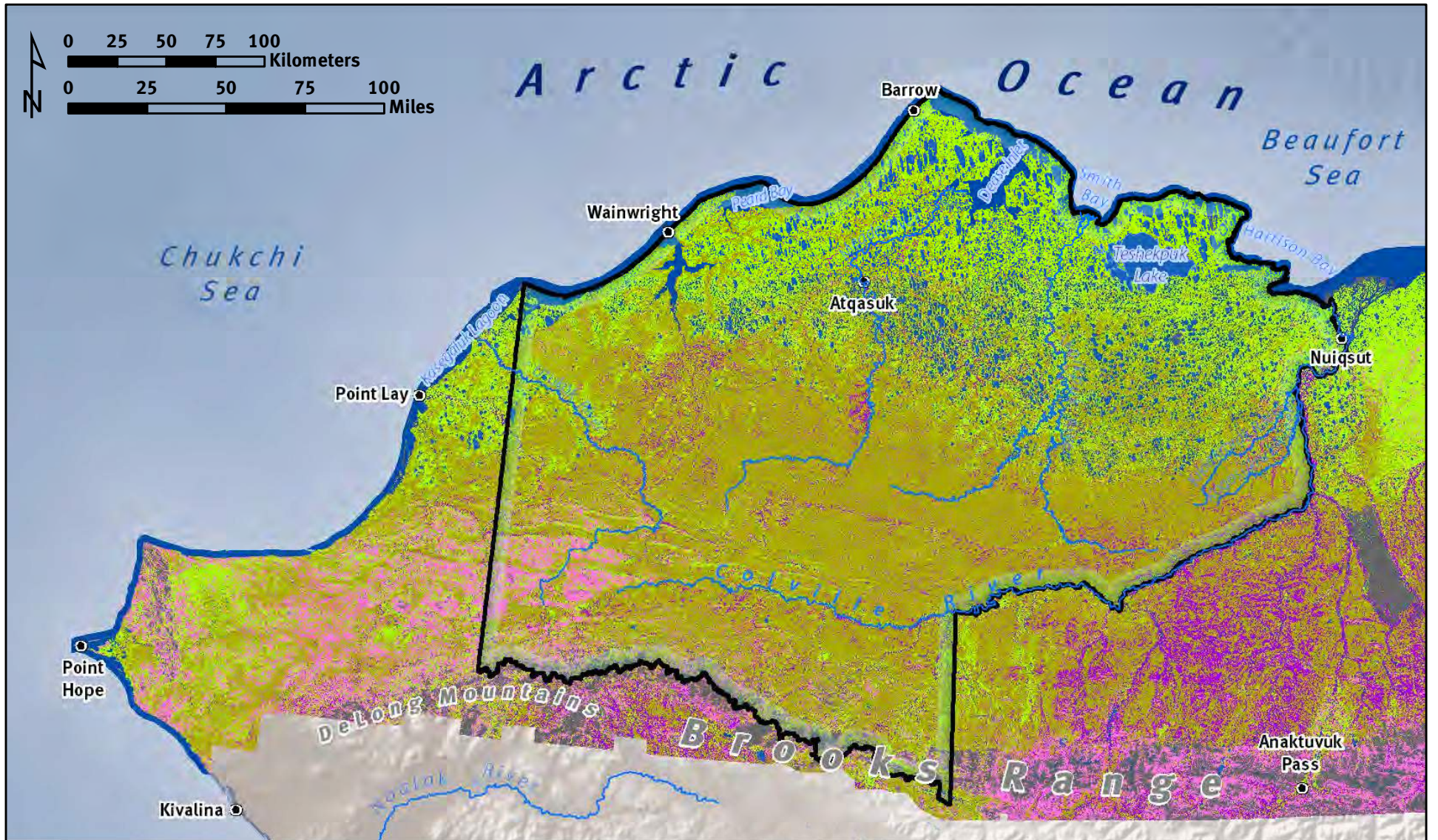
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# E C O R E G I O N S



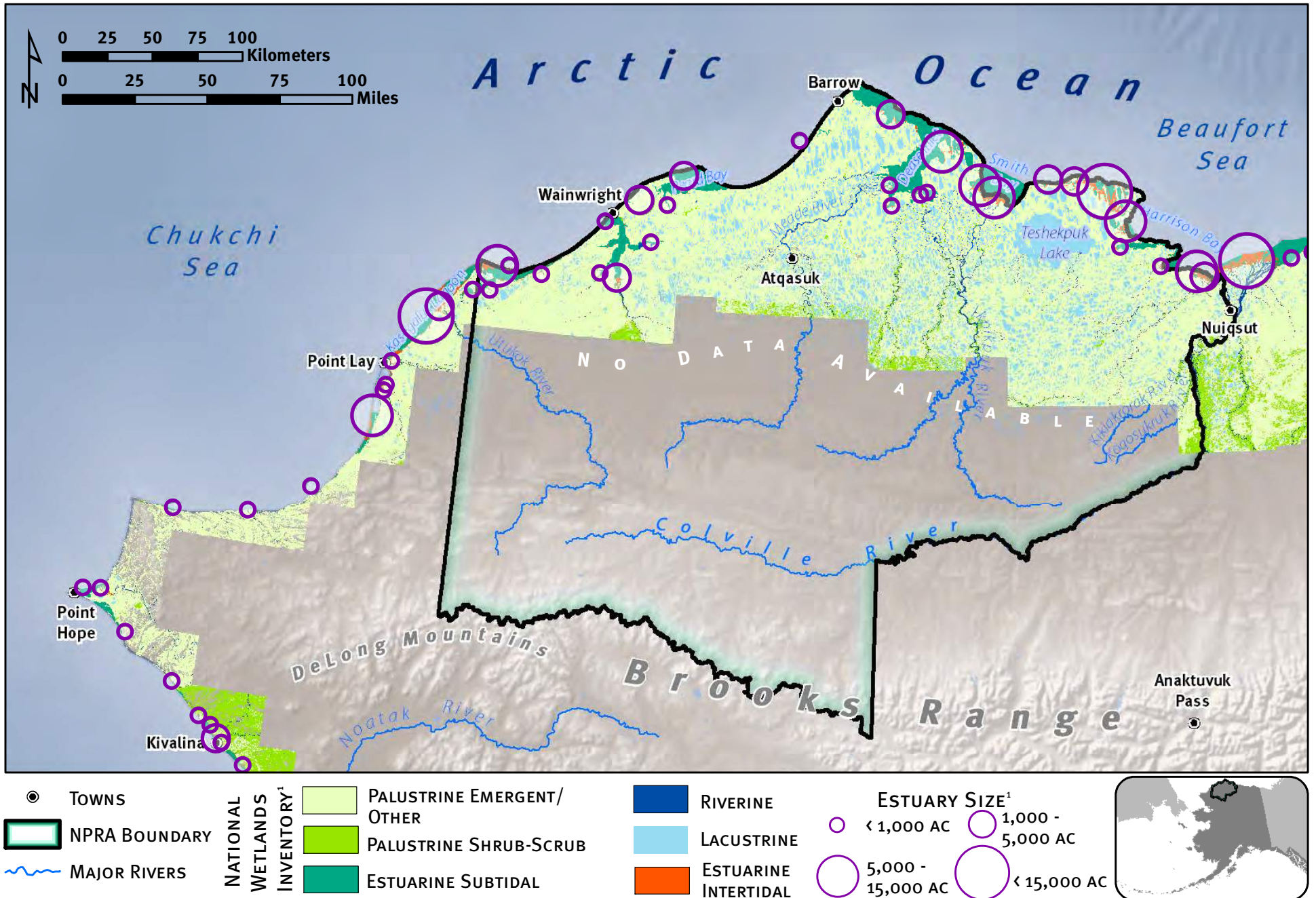


# VEGETATION





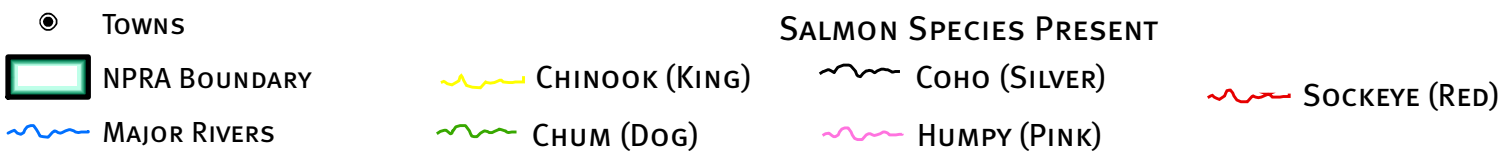
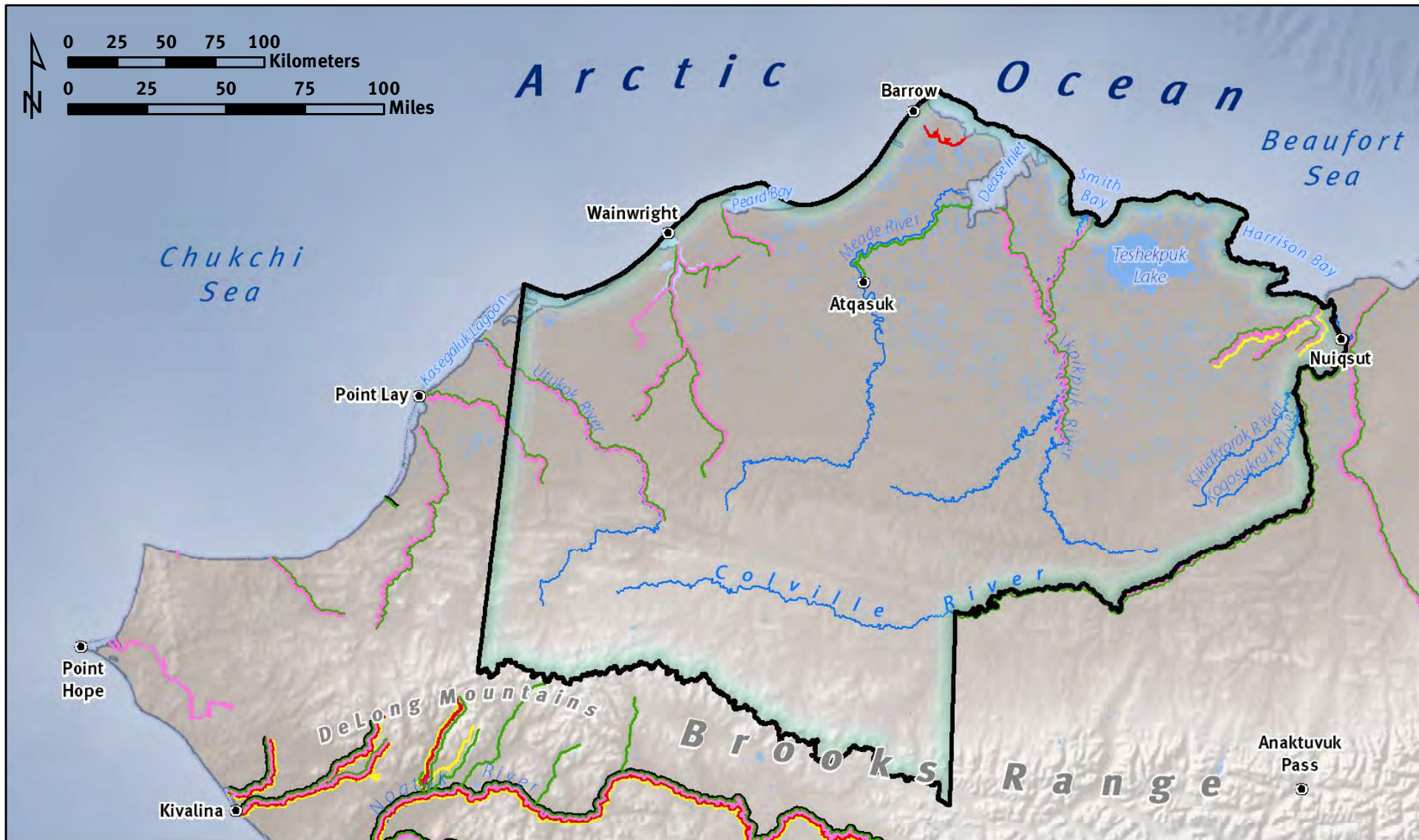
# WETLANDS AND ESTUARIES







# PACIFIC SALMON DISTRIBUTION

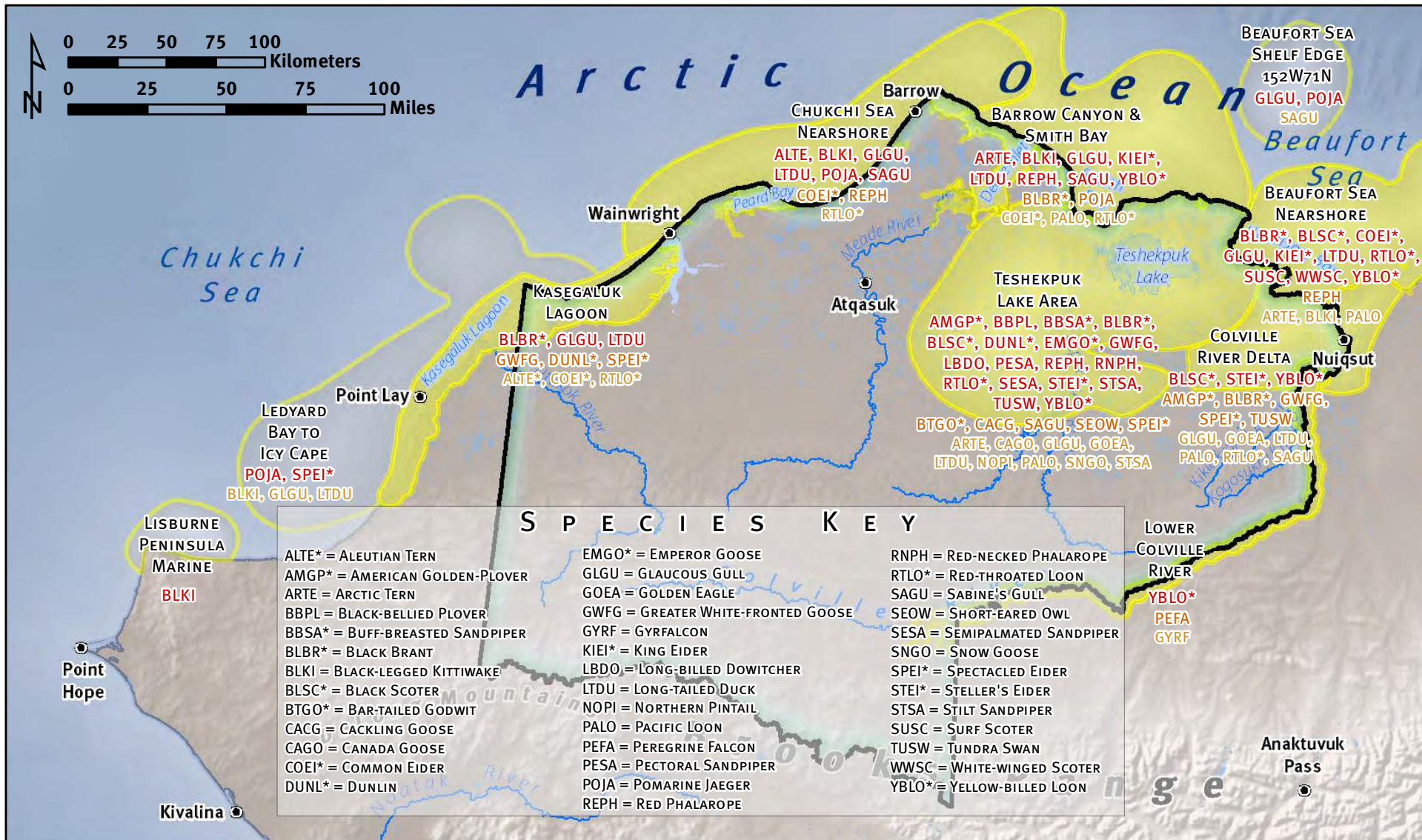








# IMPORTANT BIRD AREAS (IBAS)



- TOWNS
- ▭ NPRA BOUNDARY
- ~ MAJOR RIVERS

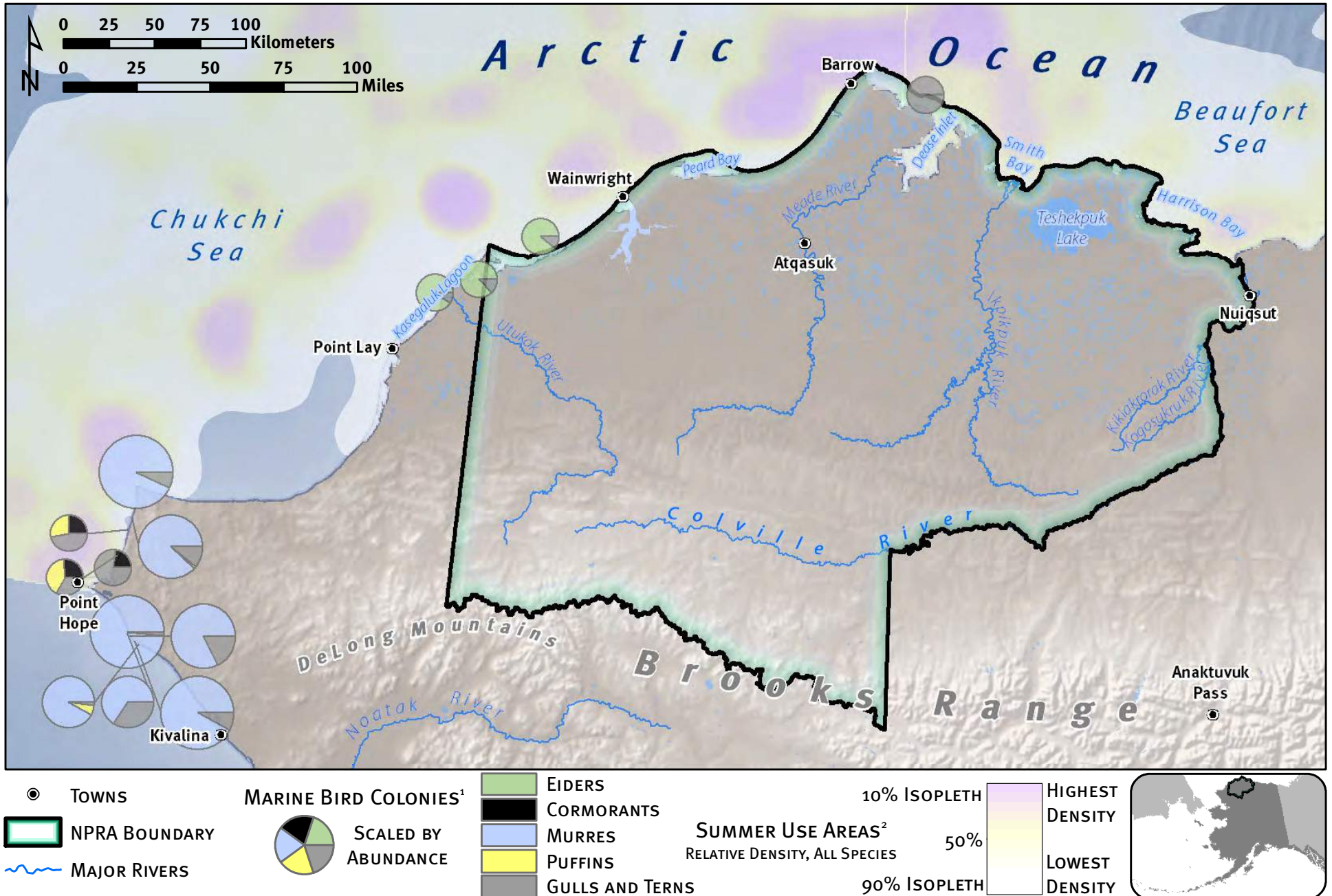
- IBAS
- IBAS WITH WATCHLIST SPECIES

- BIRD SPECIES PRESENT**
- GLOBALLY SIGNIFICANT ABUNDANCE
  - CONTINENTALLY SIGNIFICANT ABUNDANCE
  - STATE-SIGNIFICANT ABUNDANCE
  - \* DENOTES WATCHLIST SPECIES





# MARINE BIRD COLONIES AND AT-SEA USE AREAS

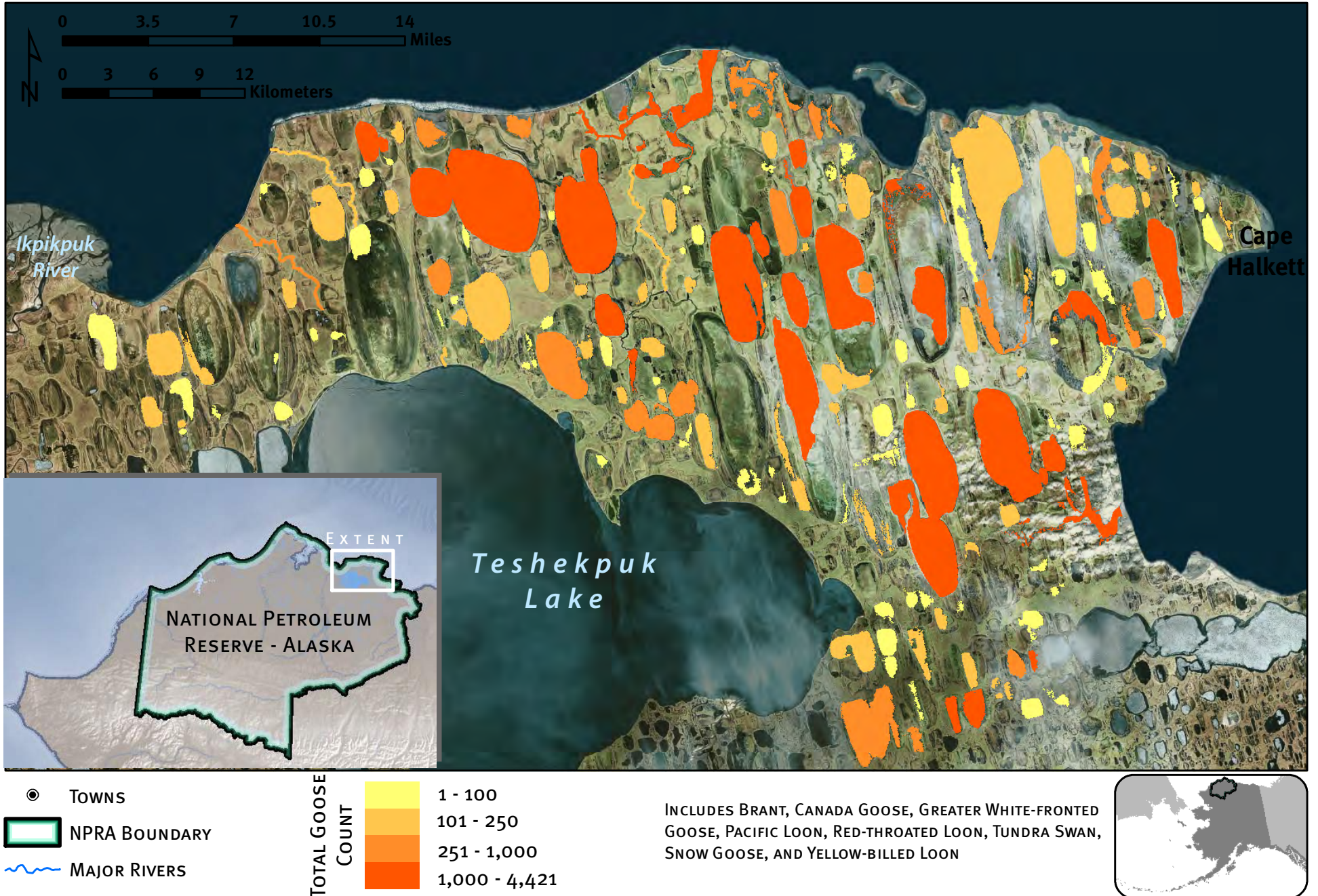


Sources: 1) USFWS 2008; 2) Audubon Alaska 2016, based on Drew and Piatt 2013, Walker and Smith 2014, and USFWS 2016.

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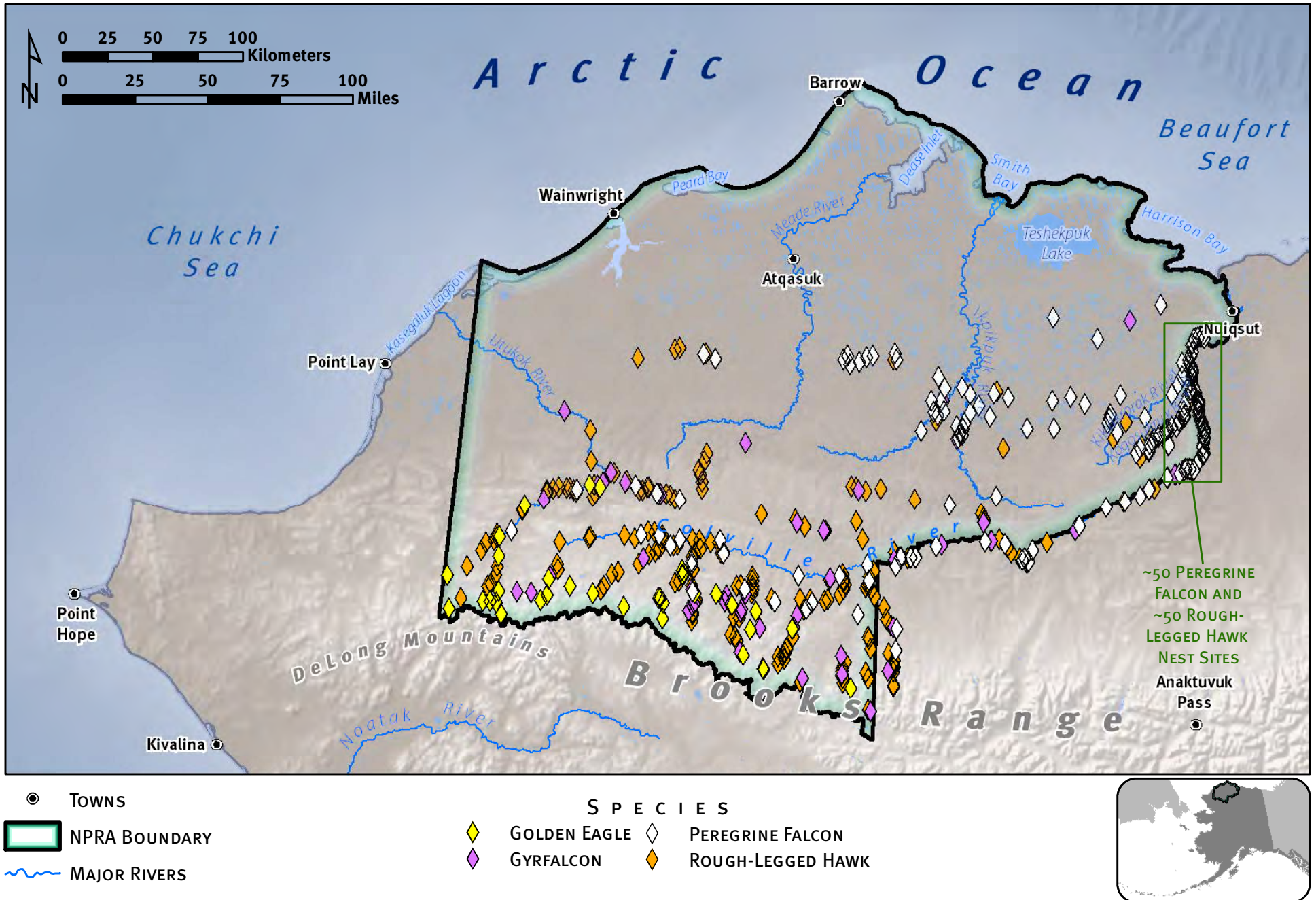


# M O L T I N G G O O S E D I S T R I B U T I O N

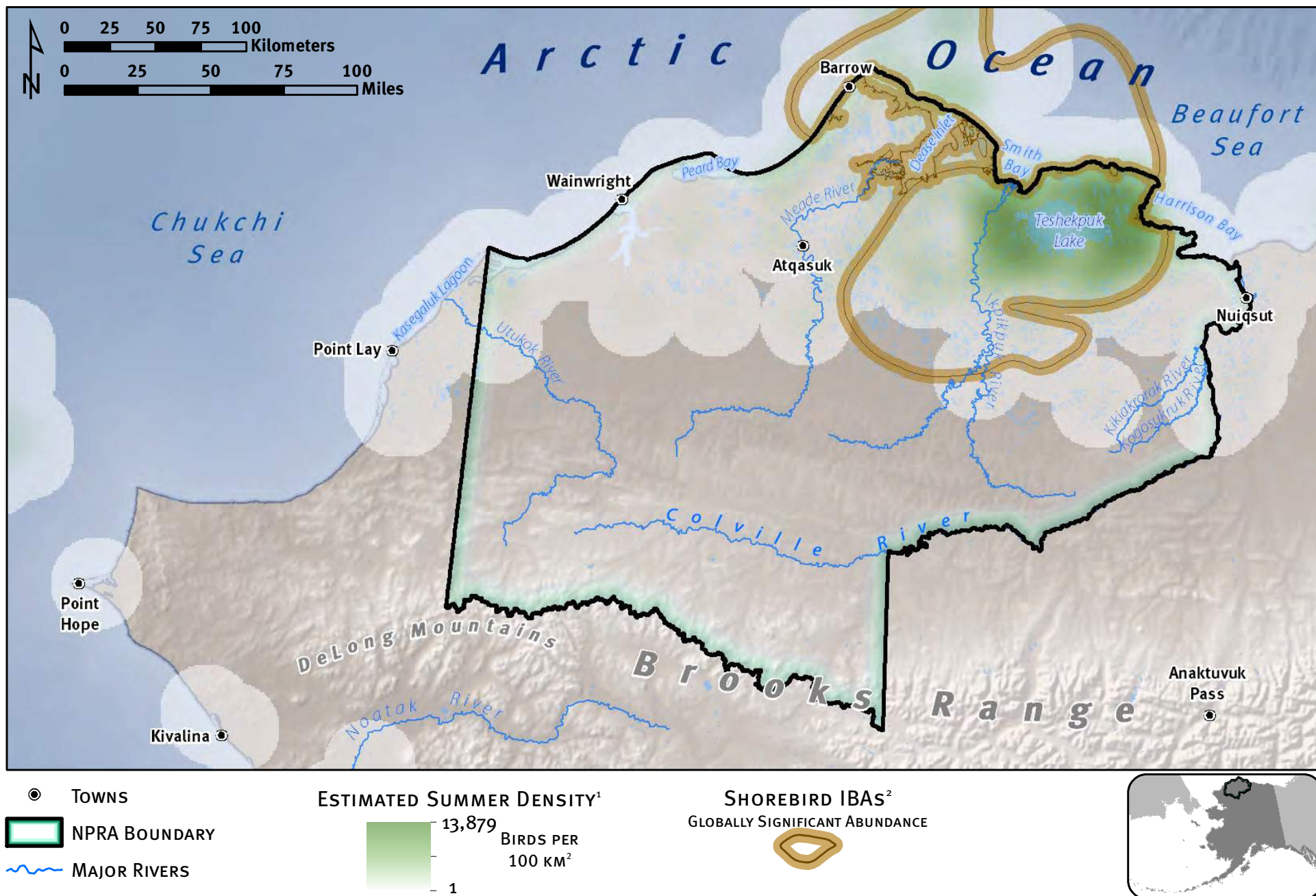




# RAPTOR NEST SITES IN NPRA



# S H O R E B I R D S

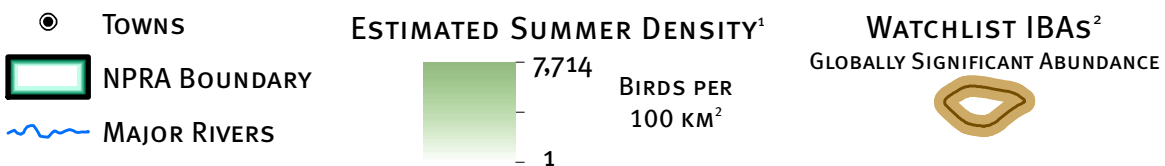
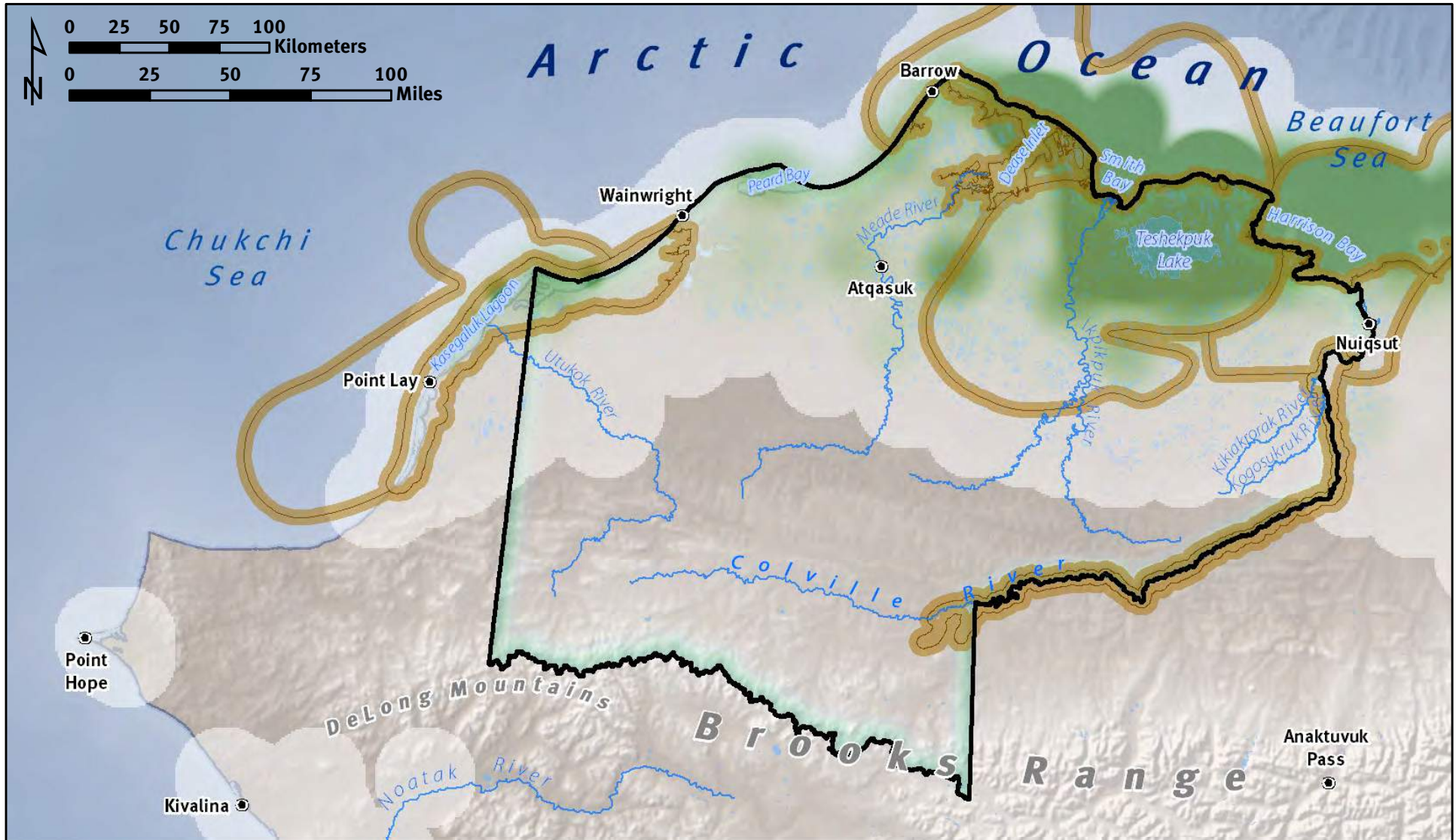


Sources: 1) Audubon Alaska 2014, based on USFWS 2014 and NPPSD 2013; 2) Audubon Alaska 2014.

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# WATCHLIST SPECIES



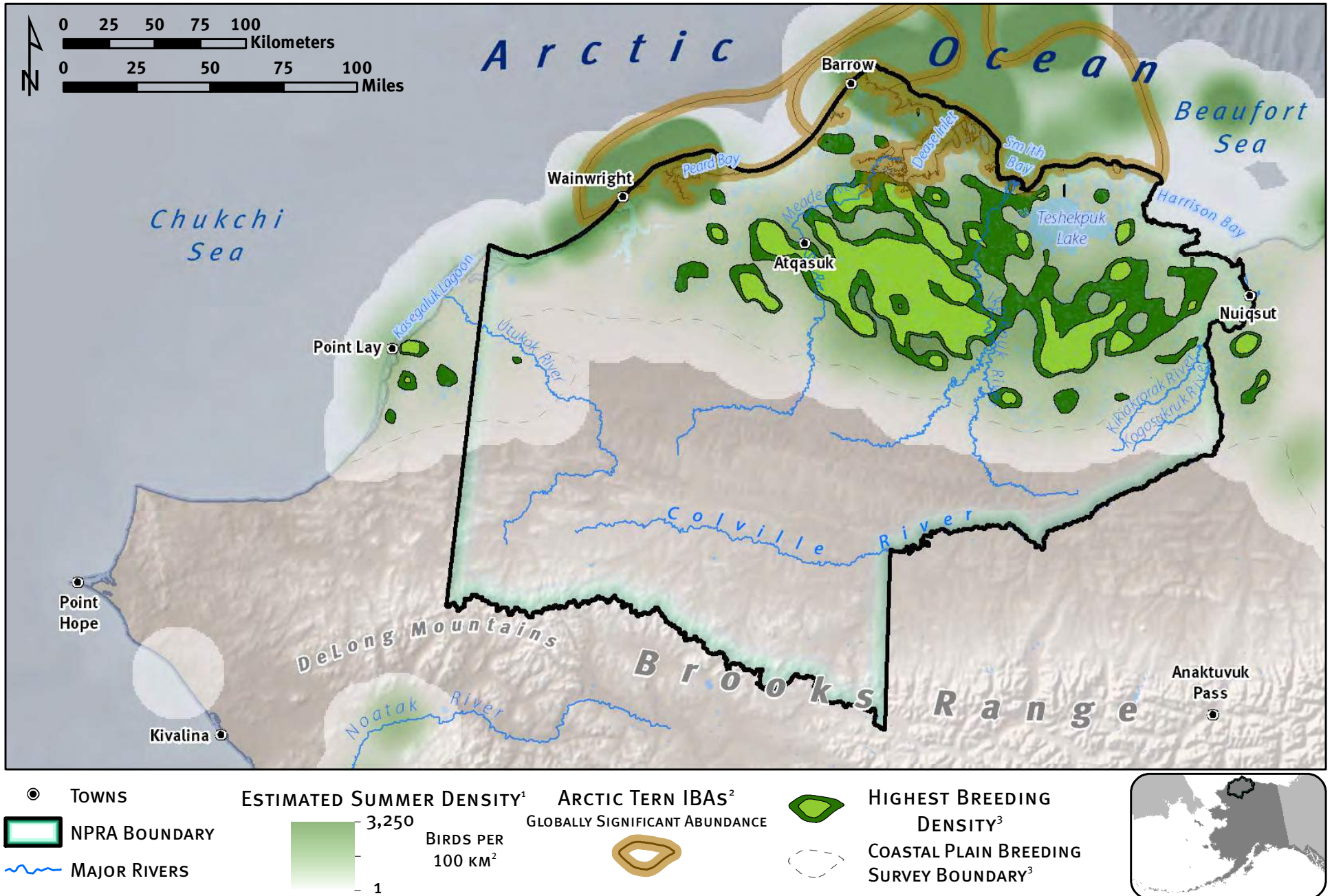
**WATCHLIST BIRDS IN STUDY AREA:**  
 ALEUTIAN TERN, AMERICAN GOLDEN-PLOVER, BUFF-BREASTED SANDPIPER, BLACK BRANT, BLACK SCOTER, BAR-TAILED GODWIT, COMMON EIDER, DUNLIN, EMPEROR GOOSE, KING EIDER, RED-THROATED LOON, SPECTACLED EIDER, STELLER'S EIDER, AND YELLOW-BILLED LOON.



Sources: 1) Audubon Alaska 2014, based on USFWS 2014 and NPPSD 2013; 2) Audubon Alaska 2014.

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# A R C T I C   T E R N

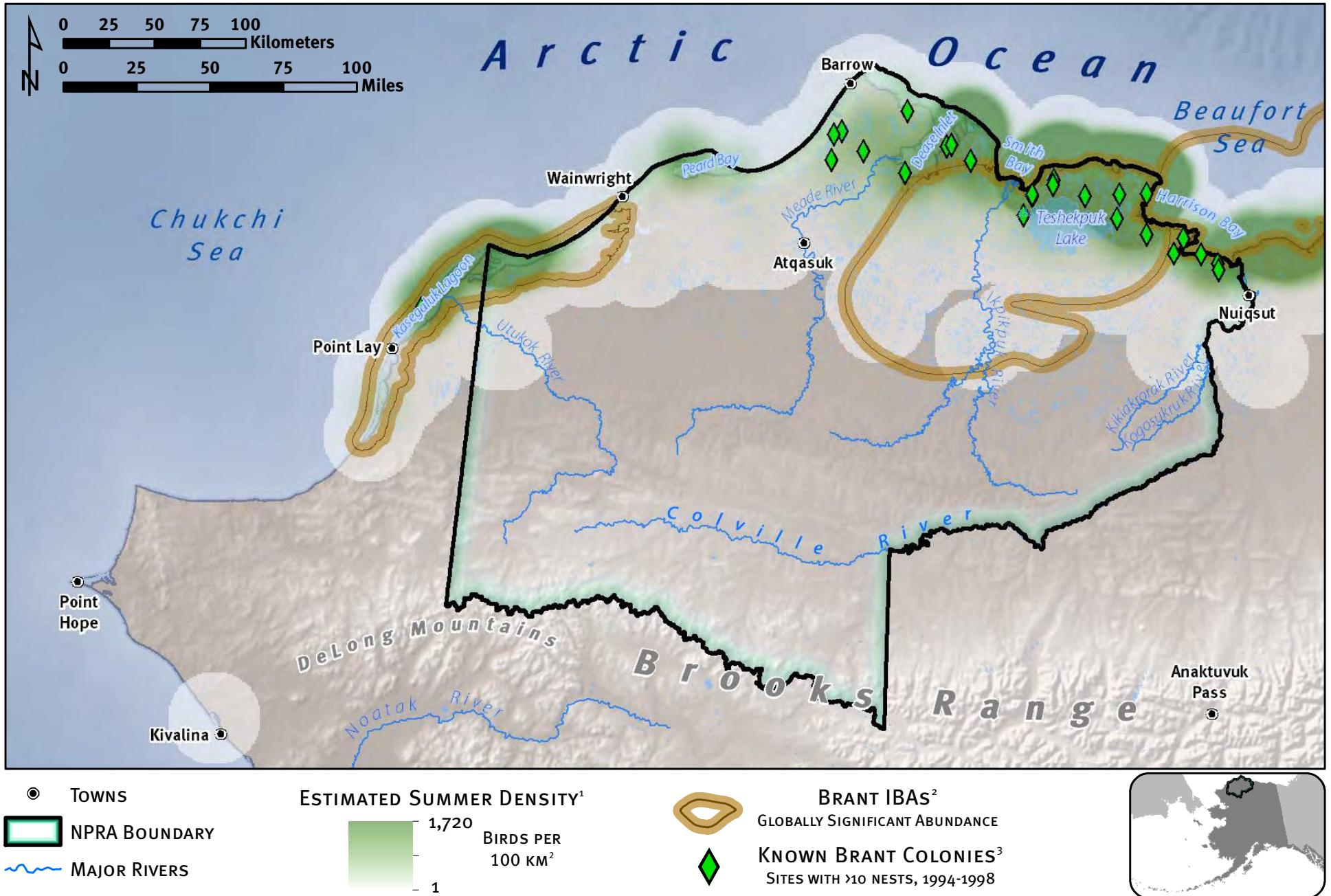


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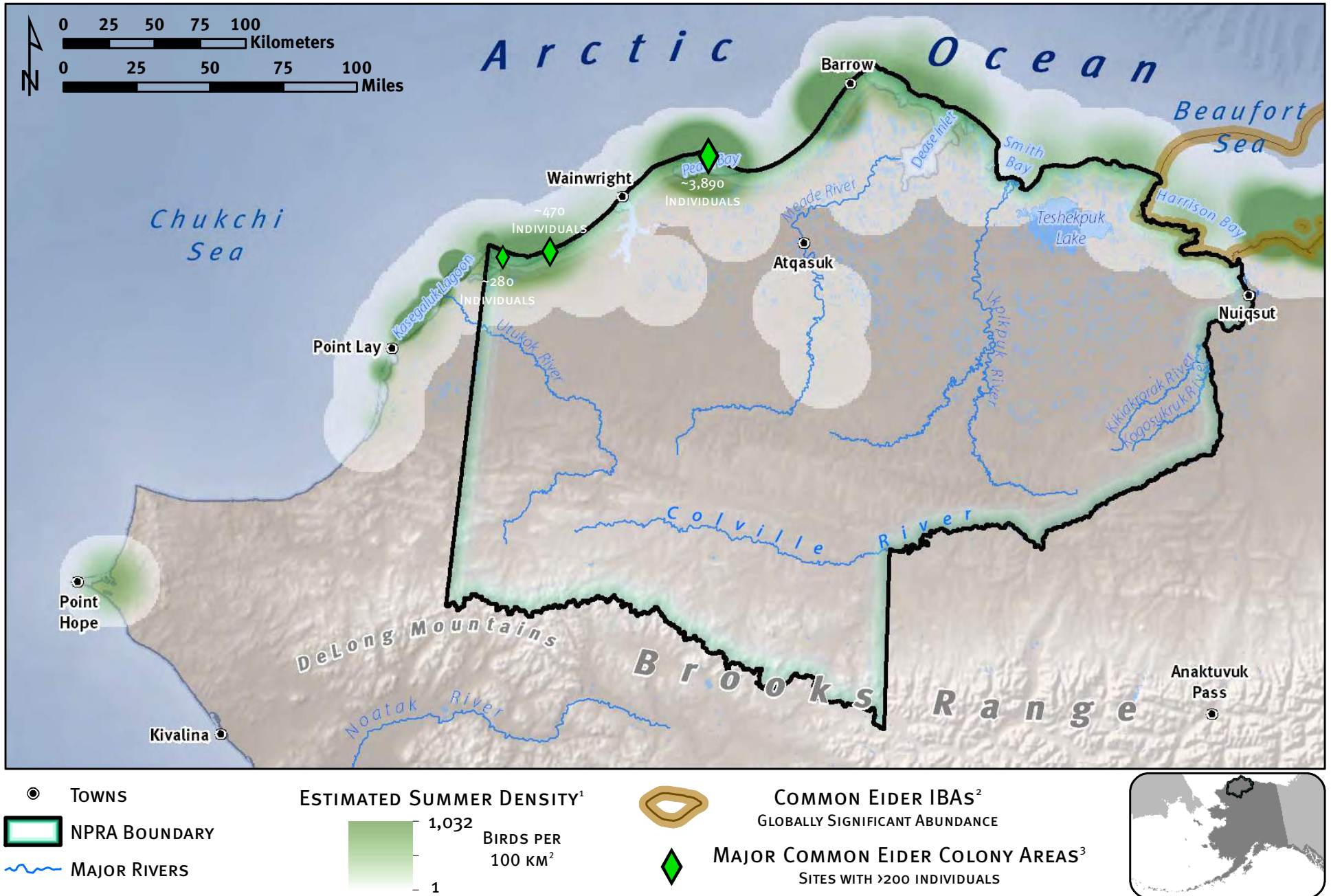
# B R A N T



Sources: 1) Audubon Alaska 2014, based on USFWS 2014 and NPPSD 2013; 2) Audubon Alaska 2014; 3) Alaska Biological Research 2002.

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# C O M M O N E I D E R



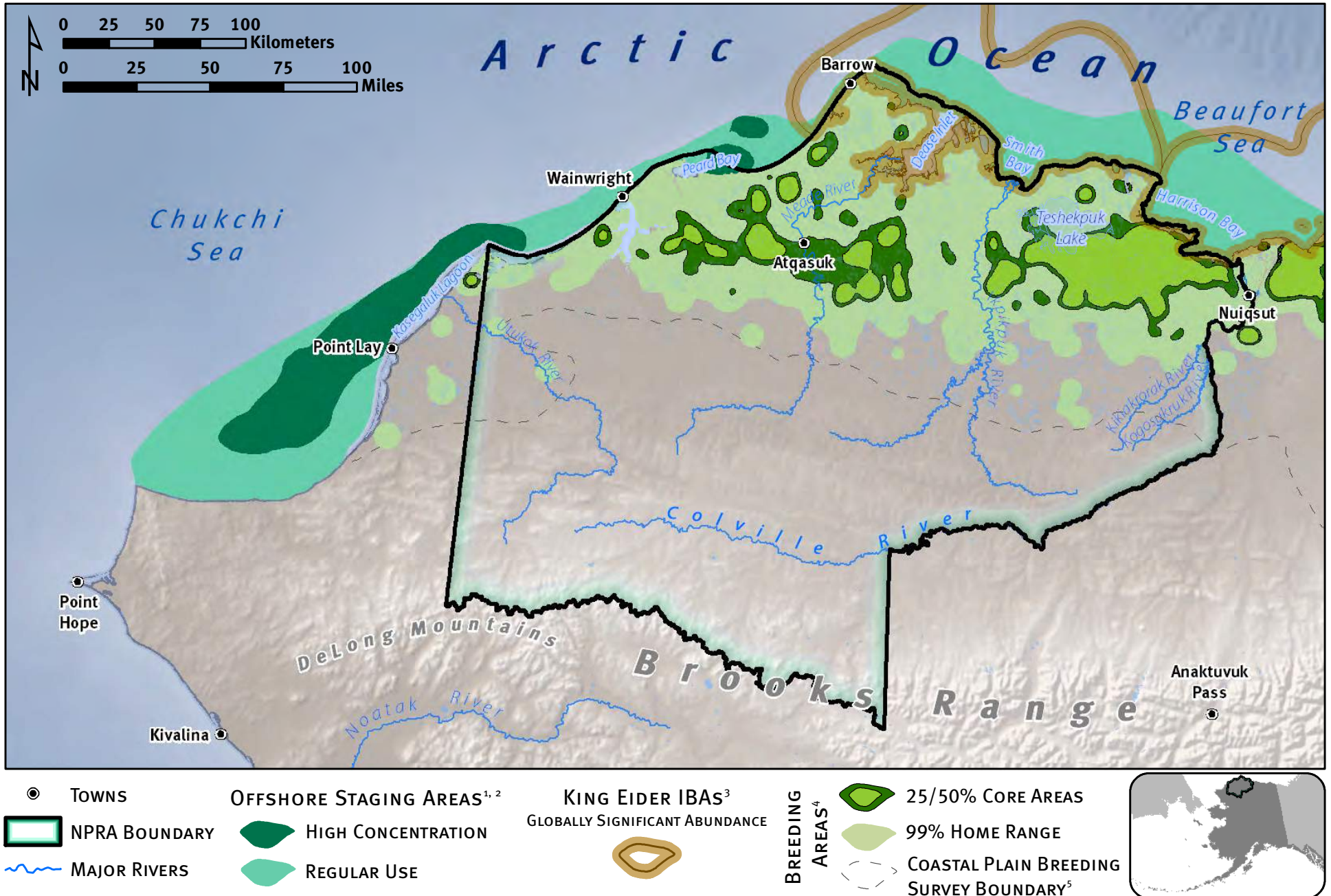
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# K I N G E I D E R

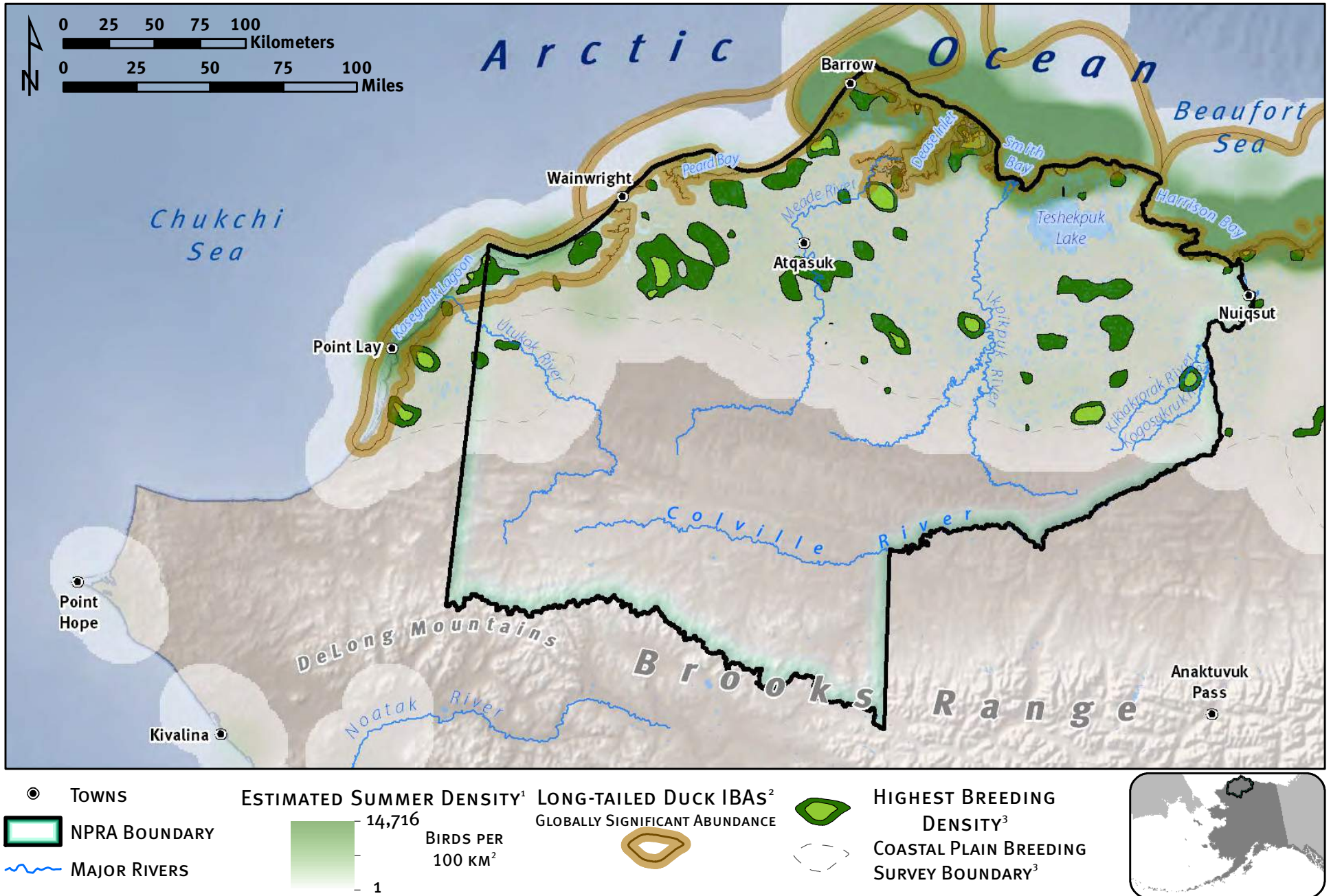


Sources: 1) Oppel 2008; 2) Oppel et al. 2009; 3) Audubon Alaska 2014; 4) Audubon Alaska 2014, based on USFWS 2014 and NPPSD 2013; 5) USFWS 2010.

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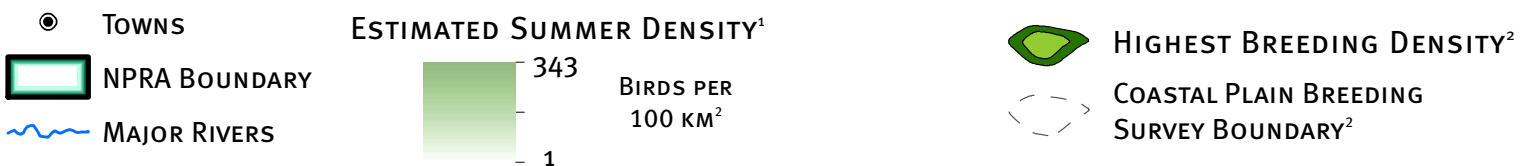
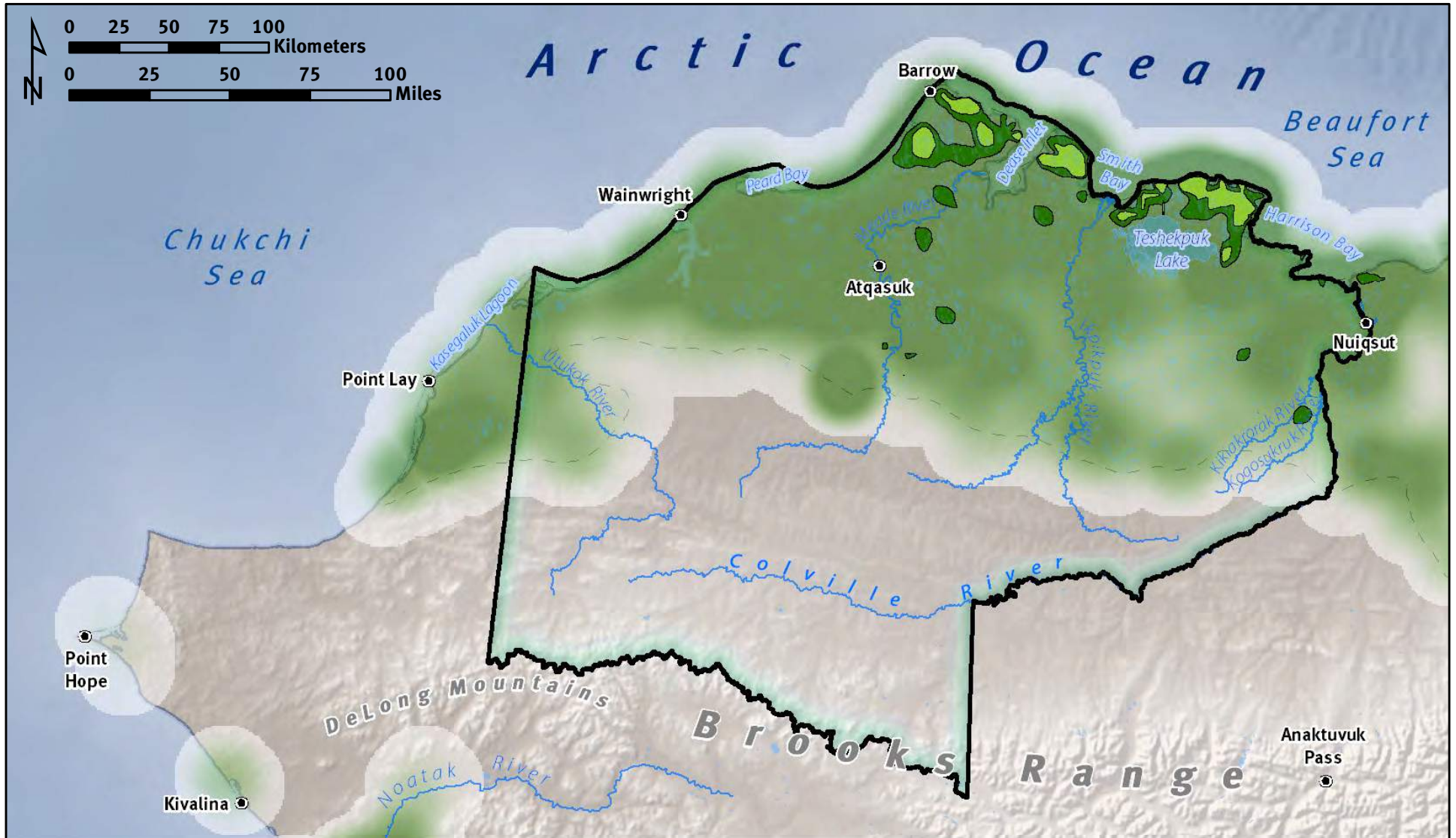
# L O N G - T A I L E D D U C K



Sources: 1) Audubon Alaska 2014, based on USFWS 2014 and NPPSD 2013; 2) Audubon Alaska 2014; 3) USFWS 2010.

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# N O R T H E R N P I N T A I L

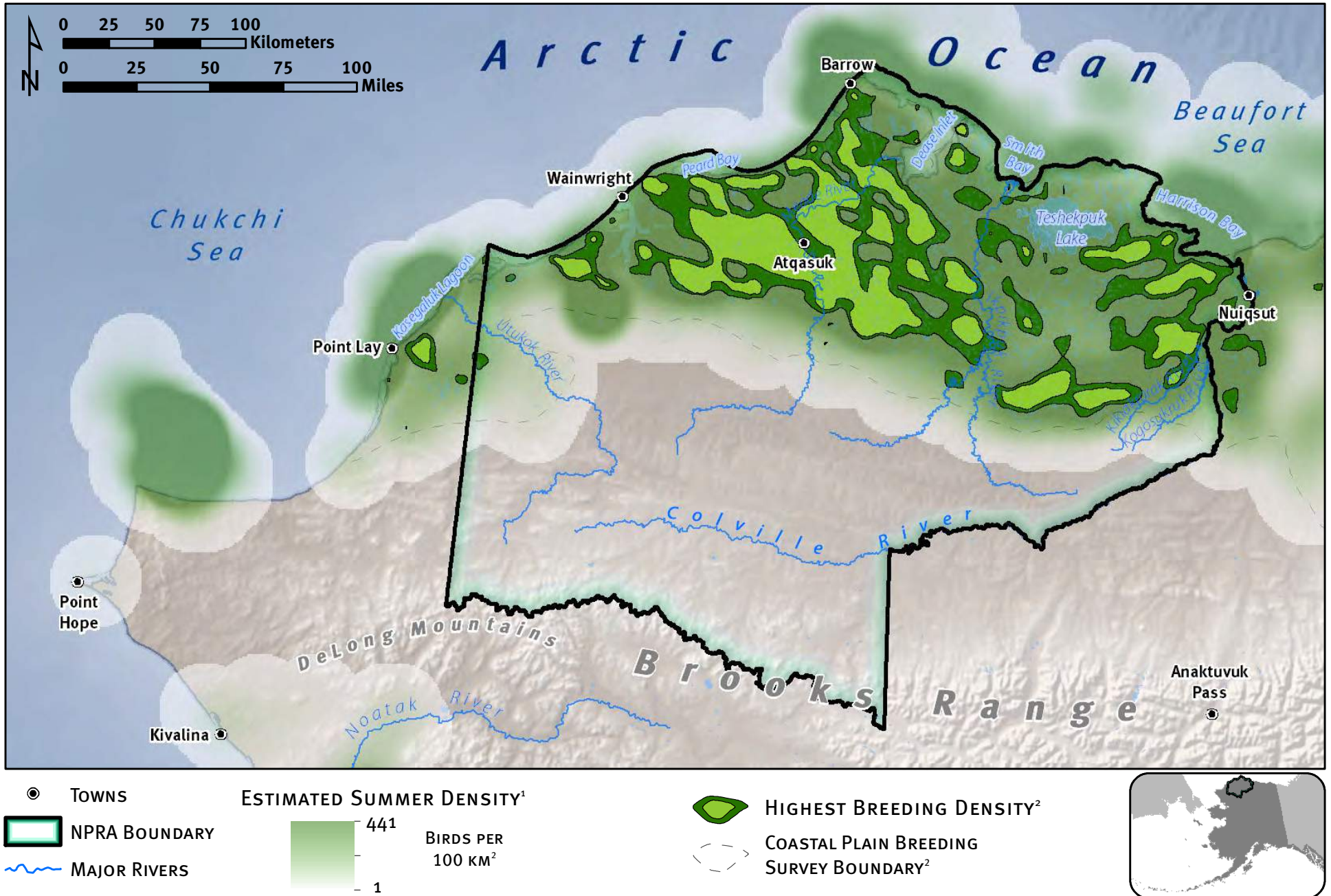


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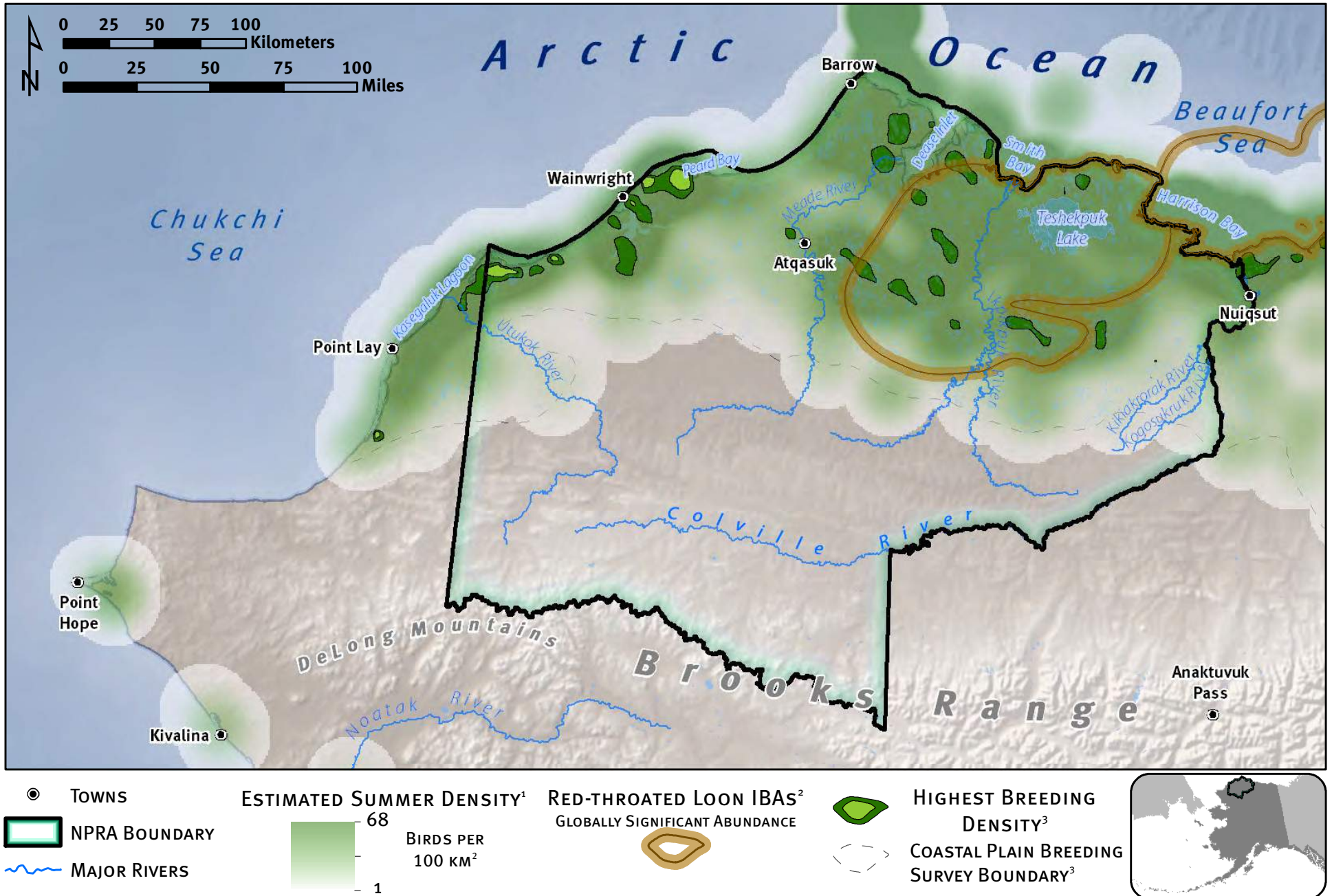


# PACIFIC LOON



Sources: 1) Audubon Alaska 2014, based on USFWS 2014 and NPPSD 2013; 2) USFWS 2010.

# R E D - T H R O A T E D L O O N

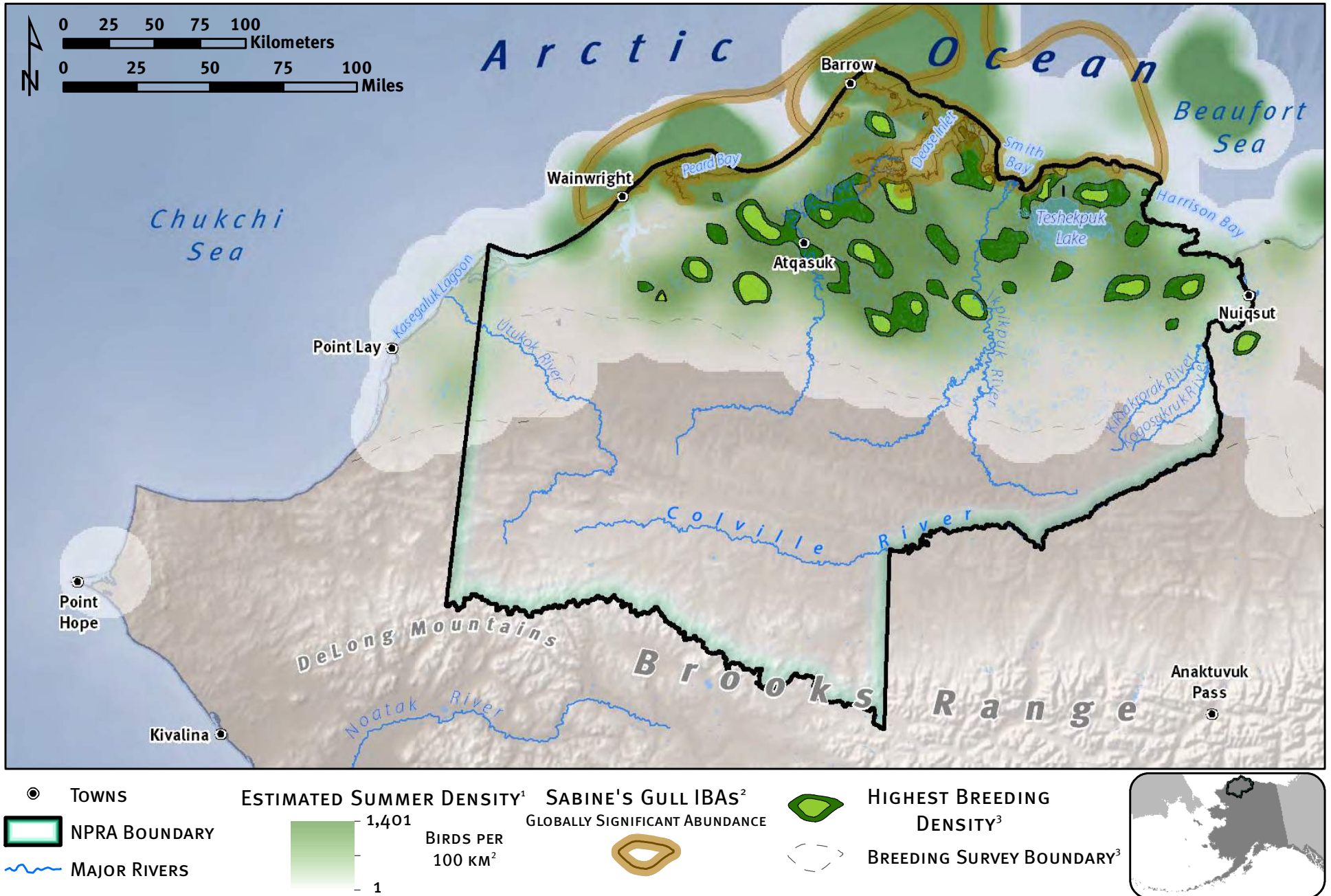


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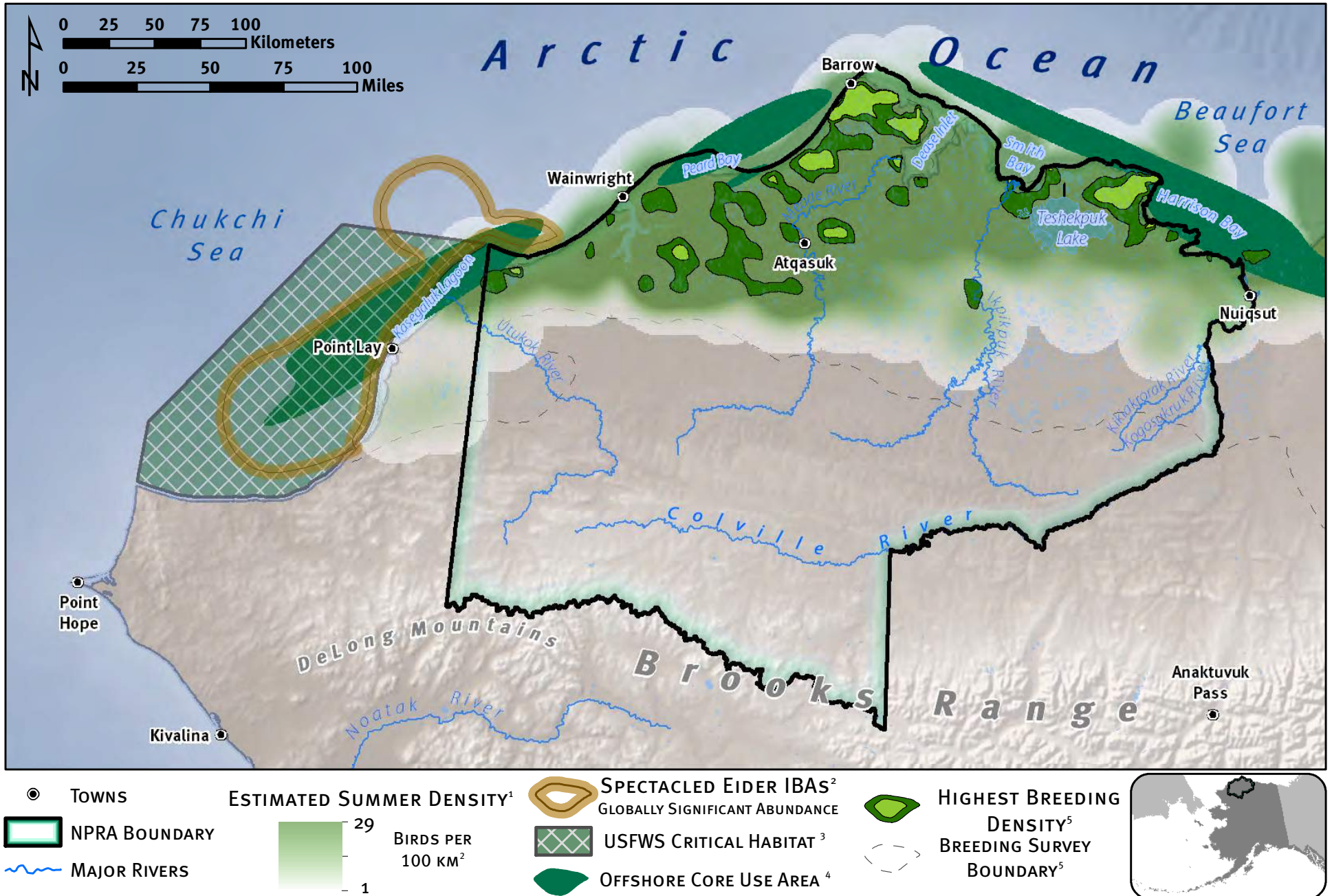
# S A B I N E ' S G U L L



Sources: 1) Audubon Alaska 2014, based on USFWS 2014 and NPPSD 2013; 2) Audubon Alaska 2014; 3) USFWS 2010.

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# S P E C T A C L E D E I D E R

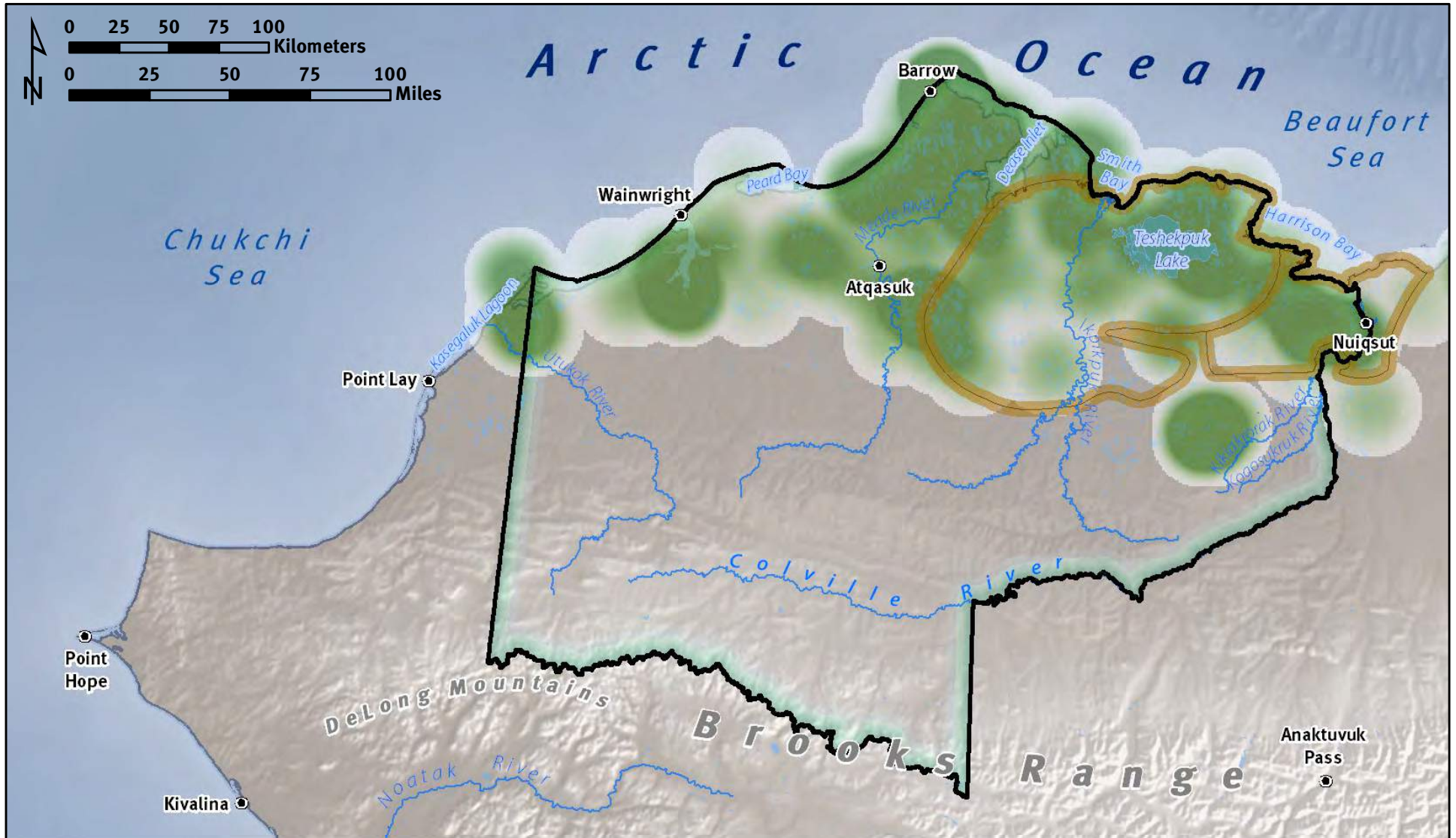


Sources: 1) Audubon Alaska 2014, based on USFWS 2014 and NPPSD 2013; 2) Audubon Alaska 2014; 3) USFWS 2001; 4) Sexson et al. 2012; 5) USFWS 2010.

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# STELLER'S EIDER

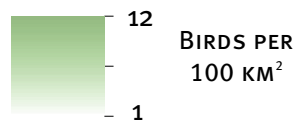


● TOWNS

NPRA BOUNDARY

MAJOR RIVERS

ESTIMATED SUMMER DENSITY<sup>1</sup>



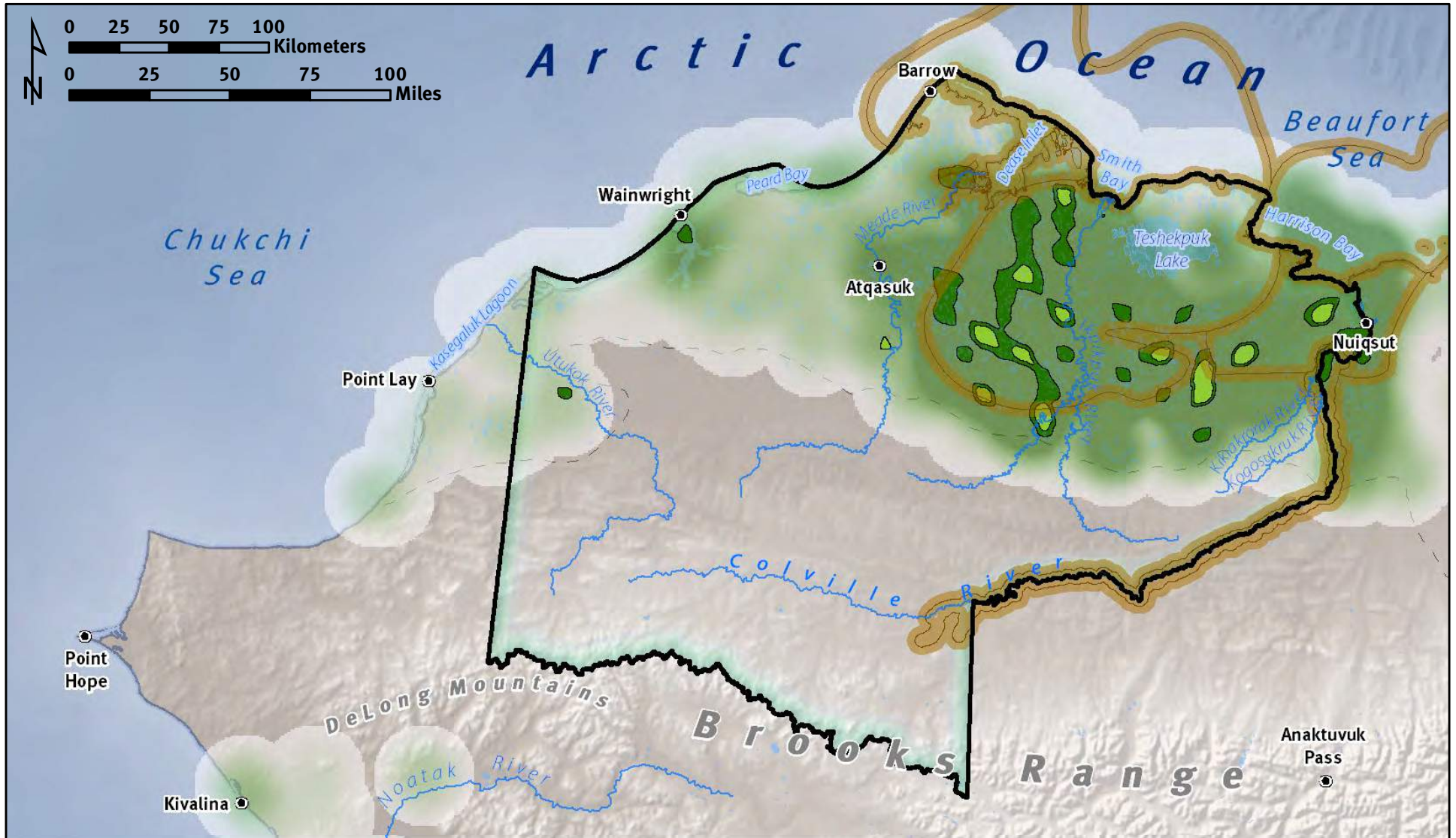
STELLER'S EIDER IBAS<sup>2</sup>  
GLOBALLY SIGNIFICANT ABUNDANCE



Sources: 1) Audubon Alaska 2014, based on USFWS 2014 and NPPSD 2013; 2) Audubon Alaska 2014.

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# Y E L L O W - B I L L E D L O O N

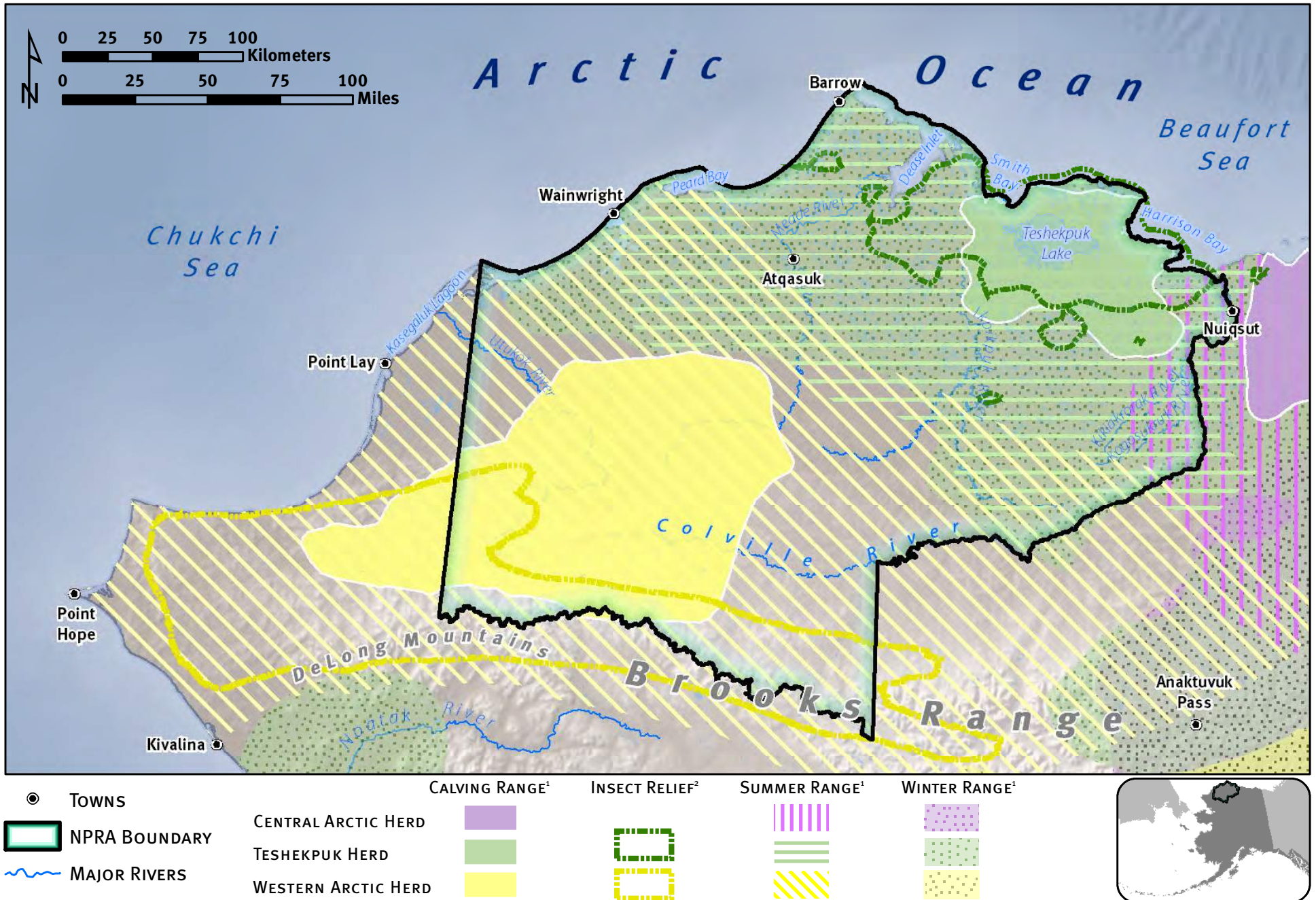


Sources: 1) Audubon Alaska 2014, based on USFWS 2014 and NPPSD 2013; 2) Audubon Alaska 2014; 3) USFWS 2010.

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# SEASONAL CARIBOU DISTRIBUTION



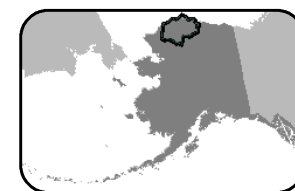
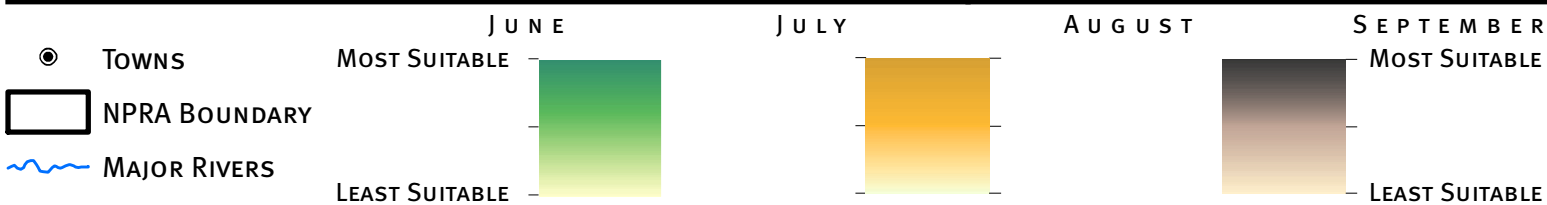
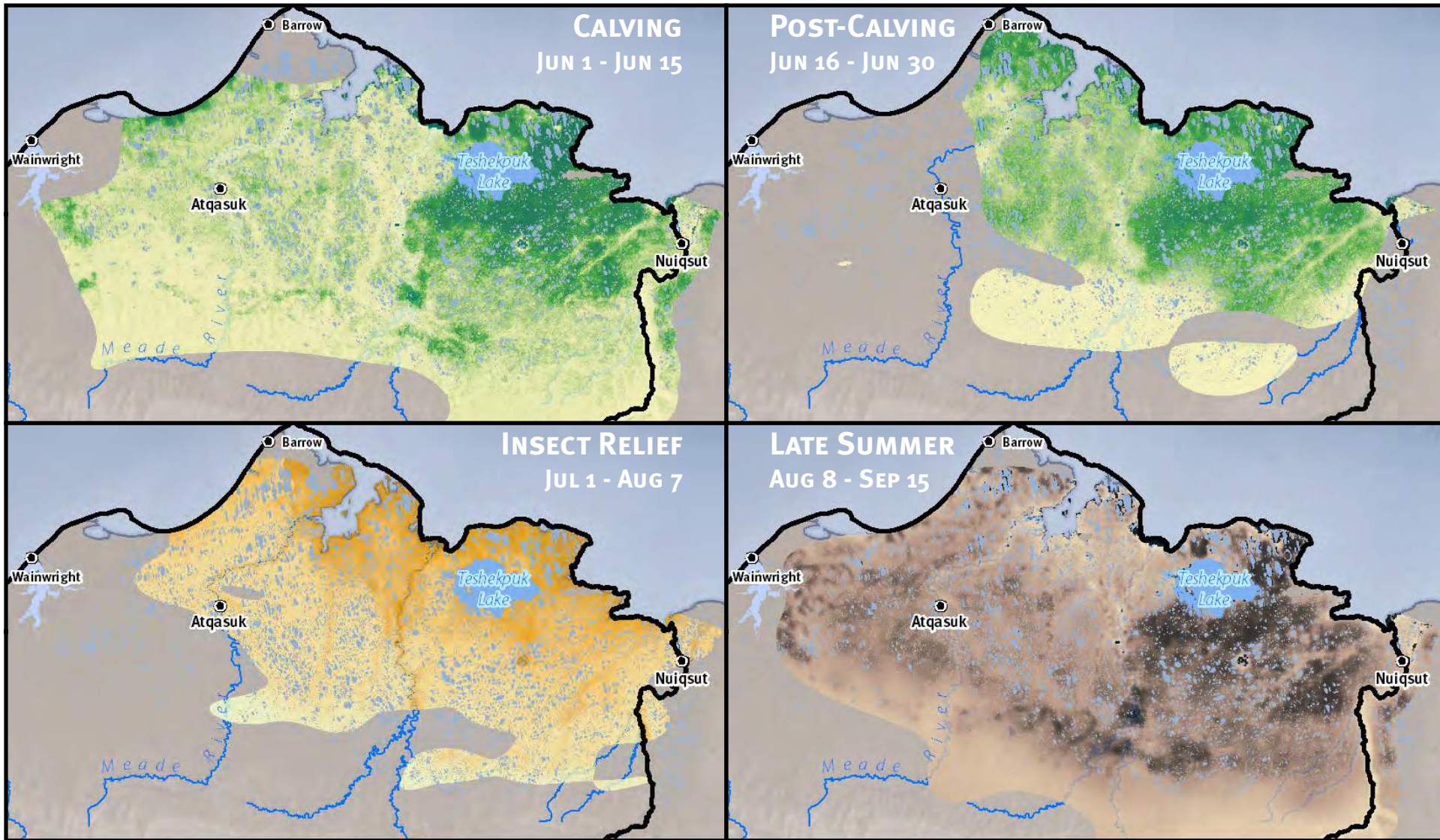
Sources: 1) Gotthardt et al. 2014; 2) Audubon Alaska 2014.

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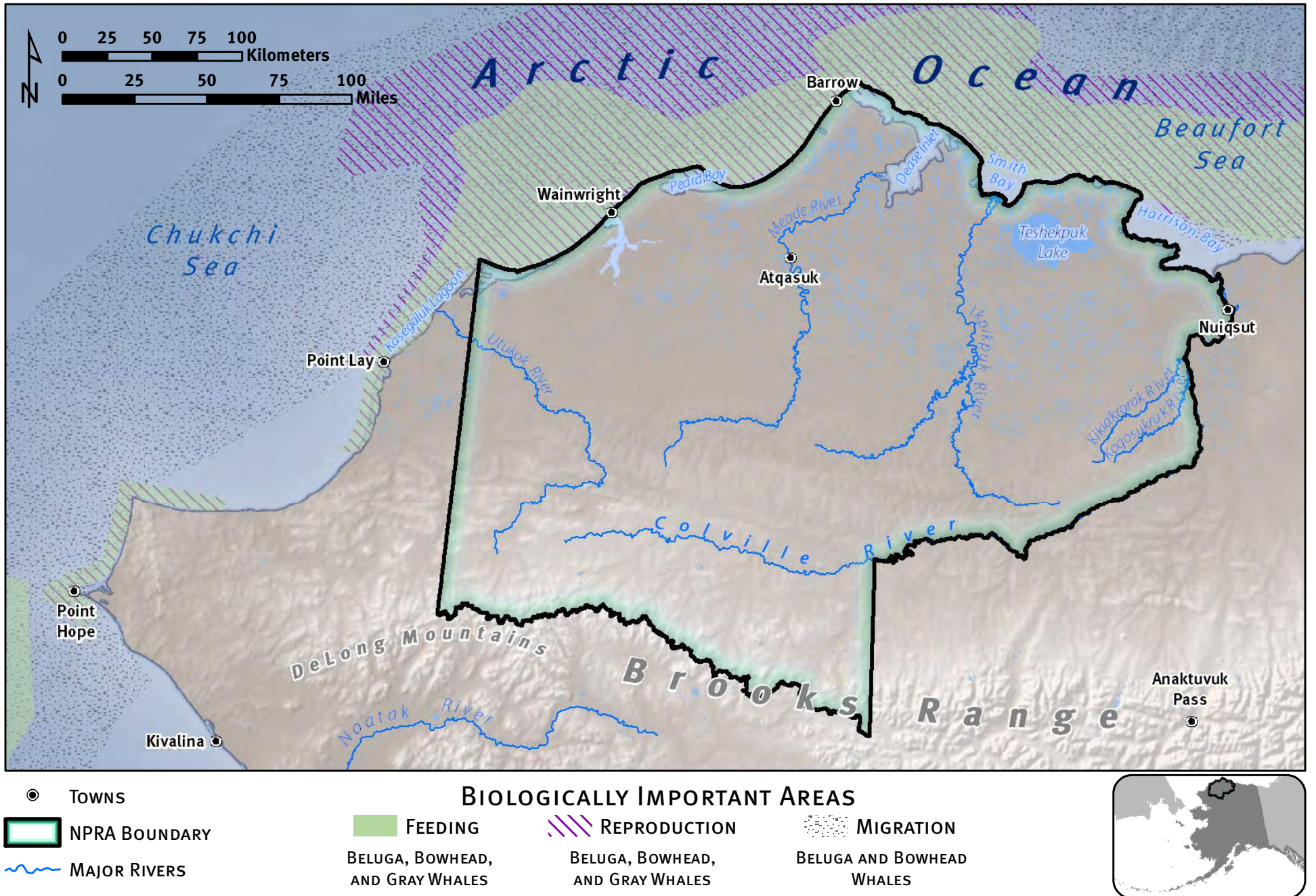
# HABITAT SUITABILITY BY SEASON

## TESHEKPUK CARIBOU HERD



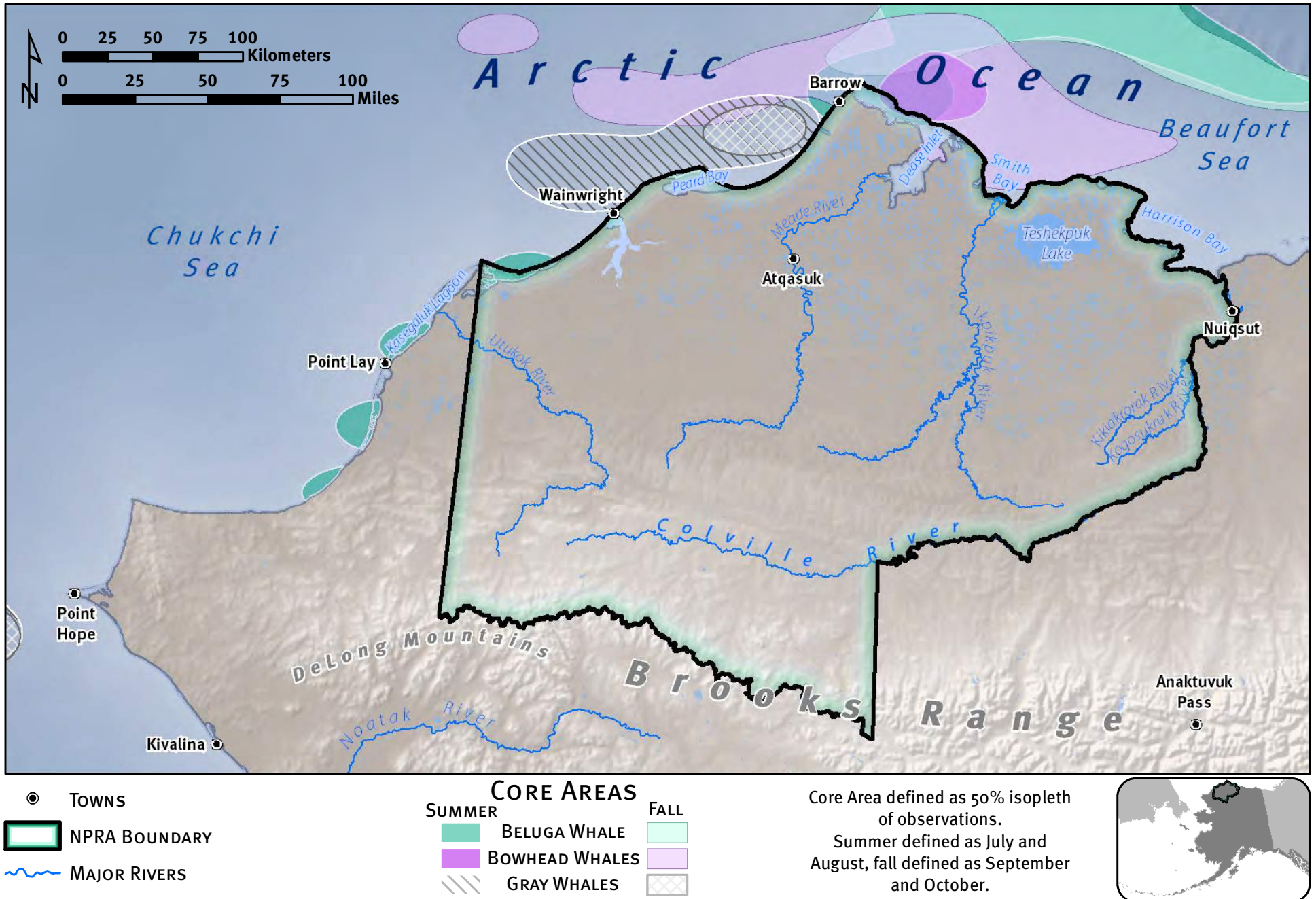


# CETACEAN BIOLOGICALLY IMPORTANT AREAS



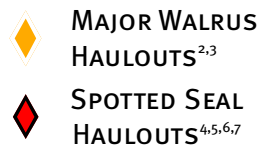
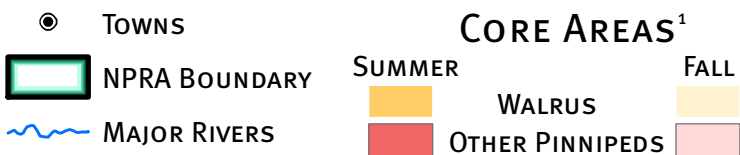
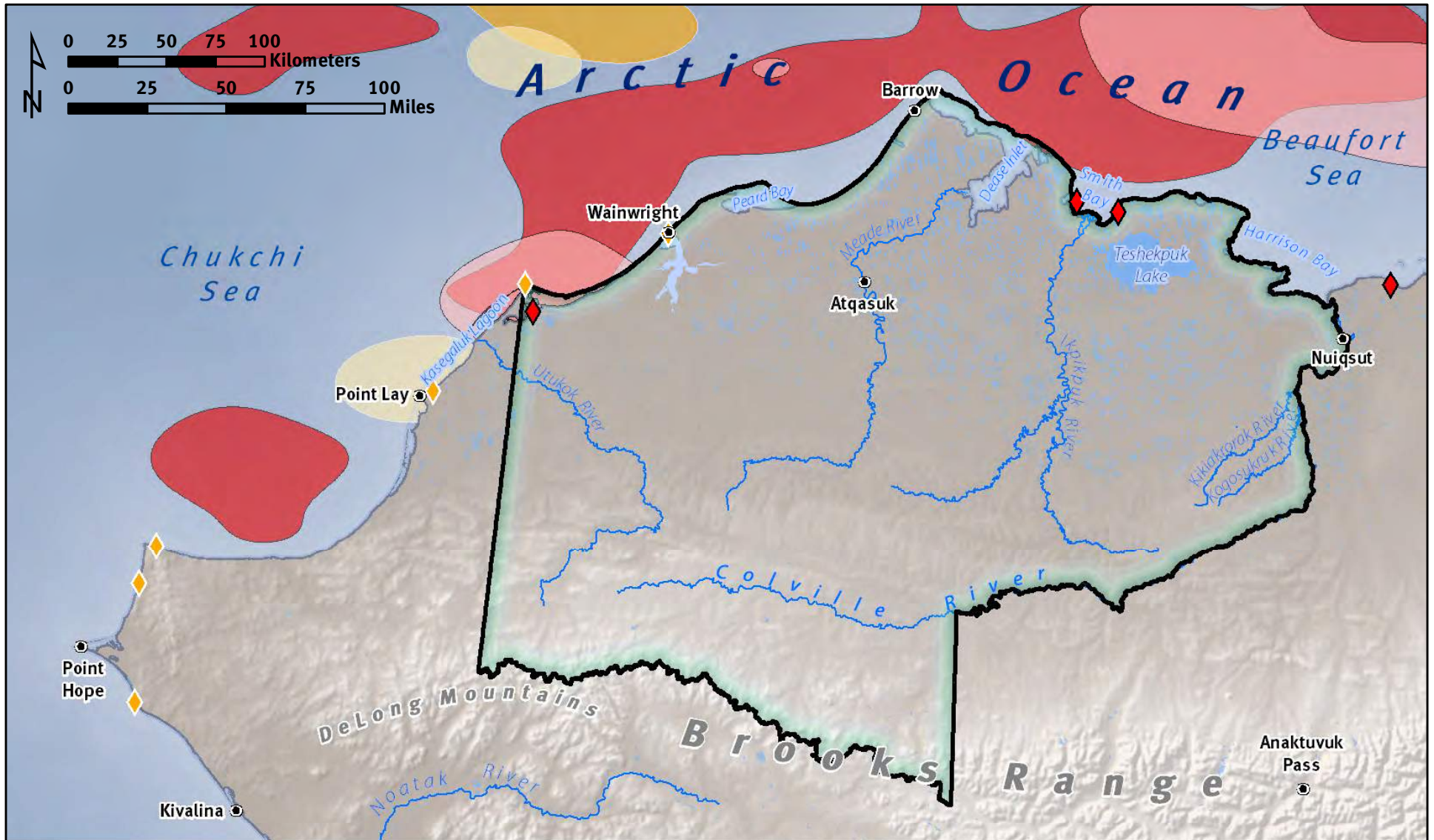


# CETACEAN DISTRIBUTION





# PINNIPED DISTRIBUTION



Core Area defined as 50% isopleth of observations.  
 Summer defined as July and August, fall defined as September and October.

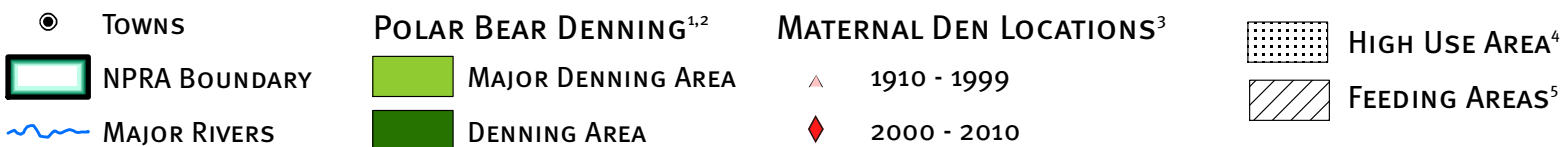
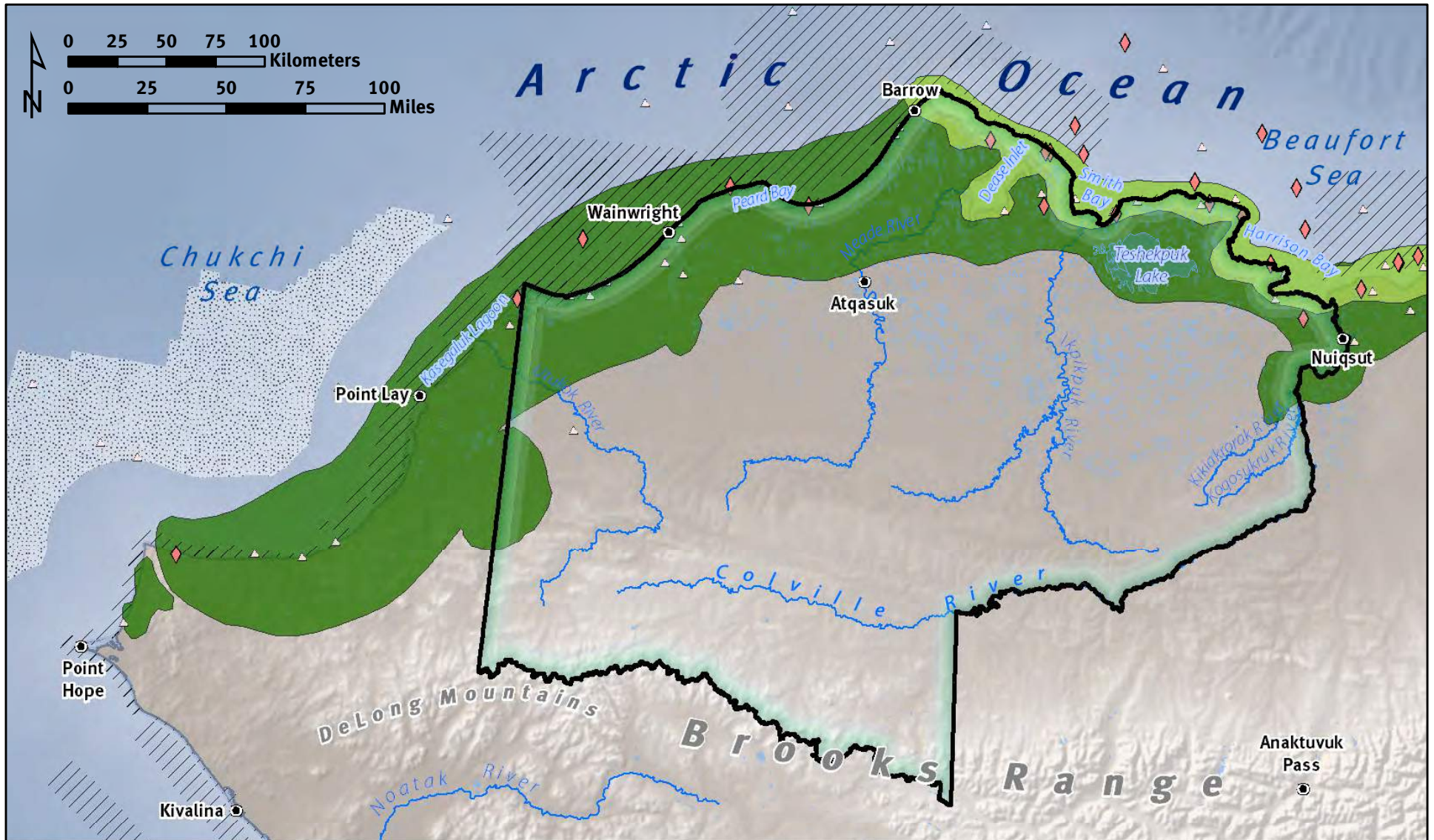


Sources: 1) Audubon Alaska and Oceana 2016, based on NOAA 2015; 2) Robards et al. 2007; 3) NOAA 2014; 4) ADF&G 1997; 5) Huntington et al. 1999; 6) Lowry et al. 1998; 7) Rugh et al. 1997.

1:2,850,000



# POLAR BEAR DENNING AND FEEDING AREAS

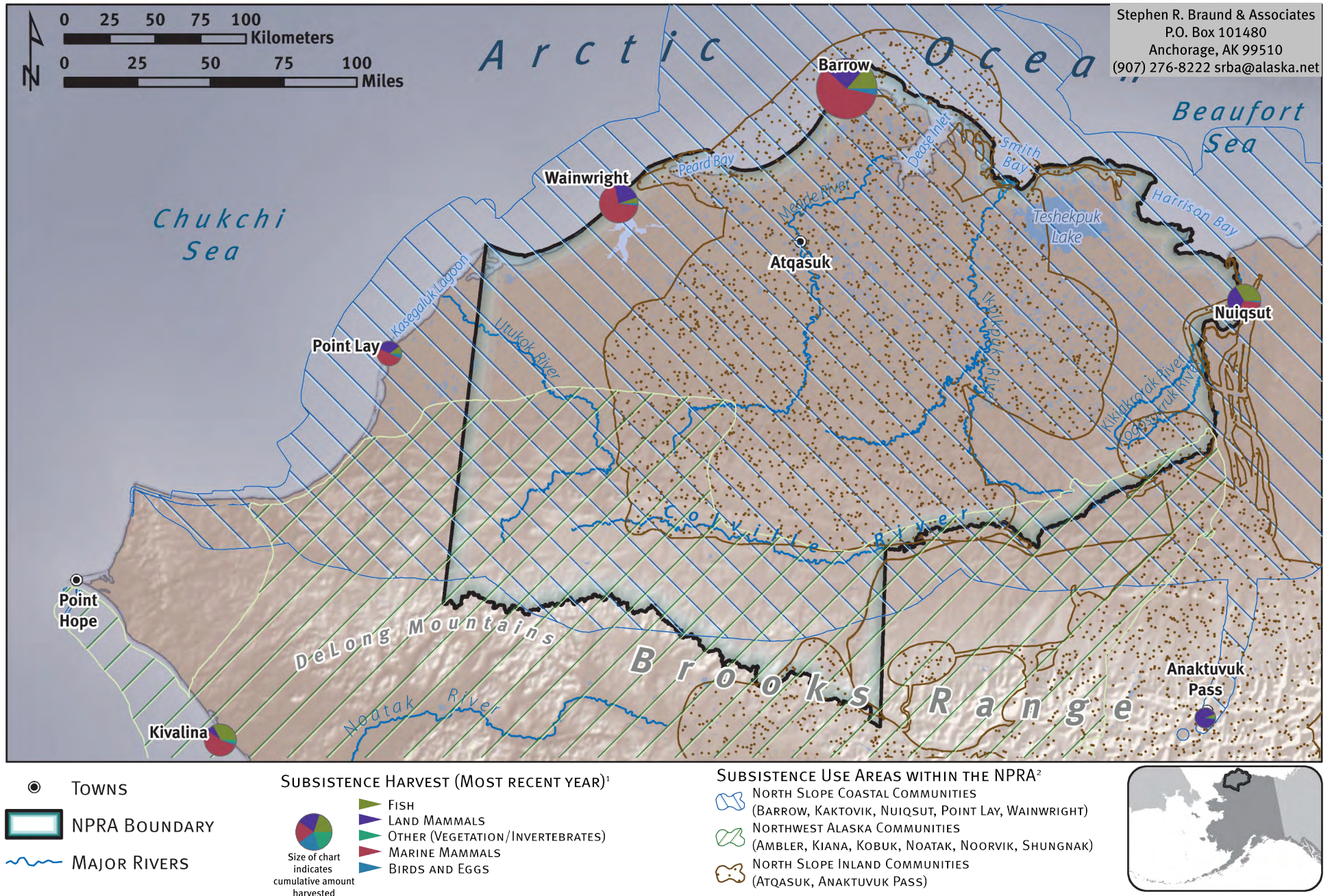


Sources: 1) NOAA 1988; 2) USFWS 1995; 3) Durner et al. 2010; 4) USFWS 2010; 5) Kalxdorff 1997.

1:2,850,000



# S U B S I S T E N C E U S E

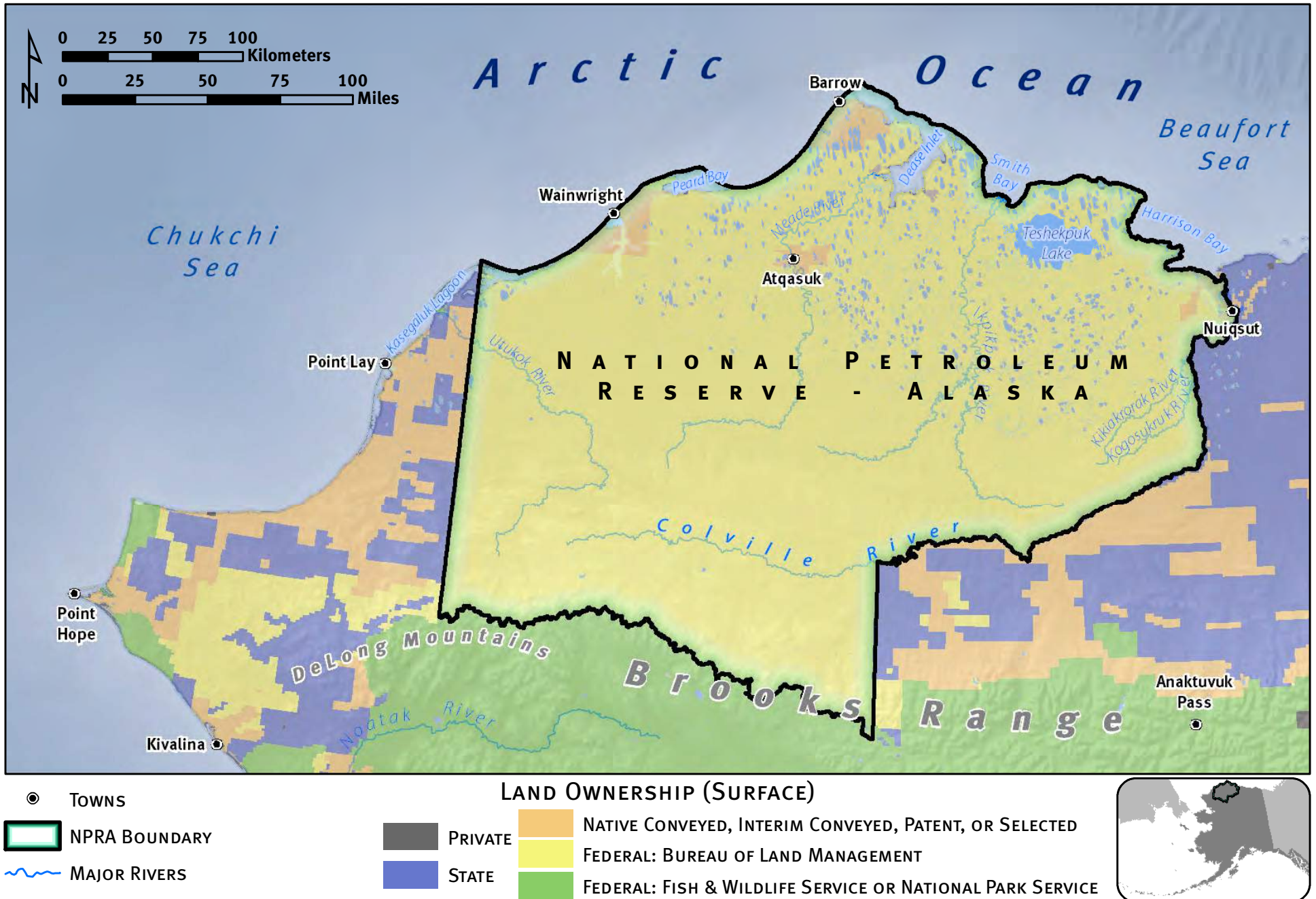


Sources: 1) ADF&G 2015; 2) See Table A. Map created by Stephen R. Braund & Associates and Audubon Alaska.

1:2,850,000



# LAND OWNERSHIP

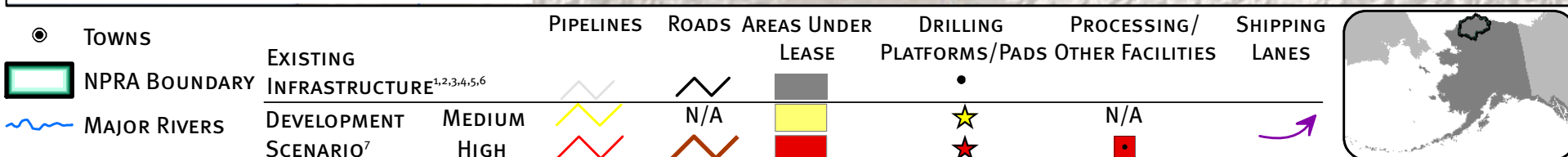
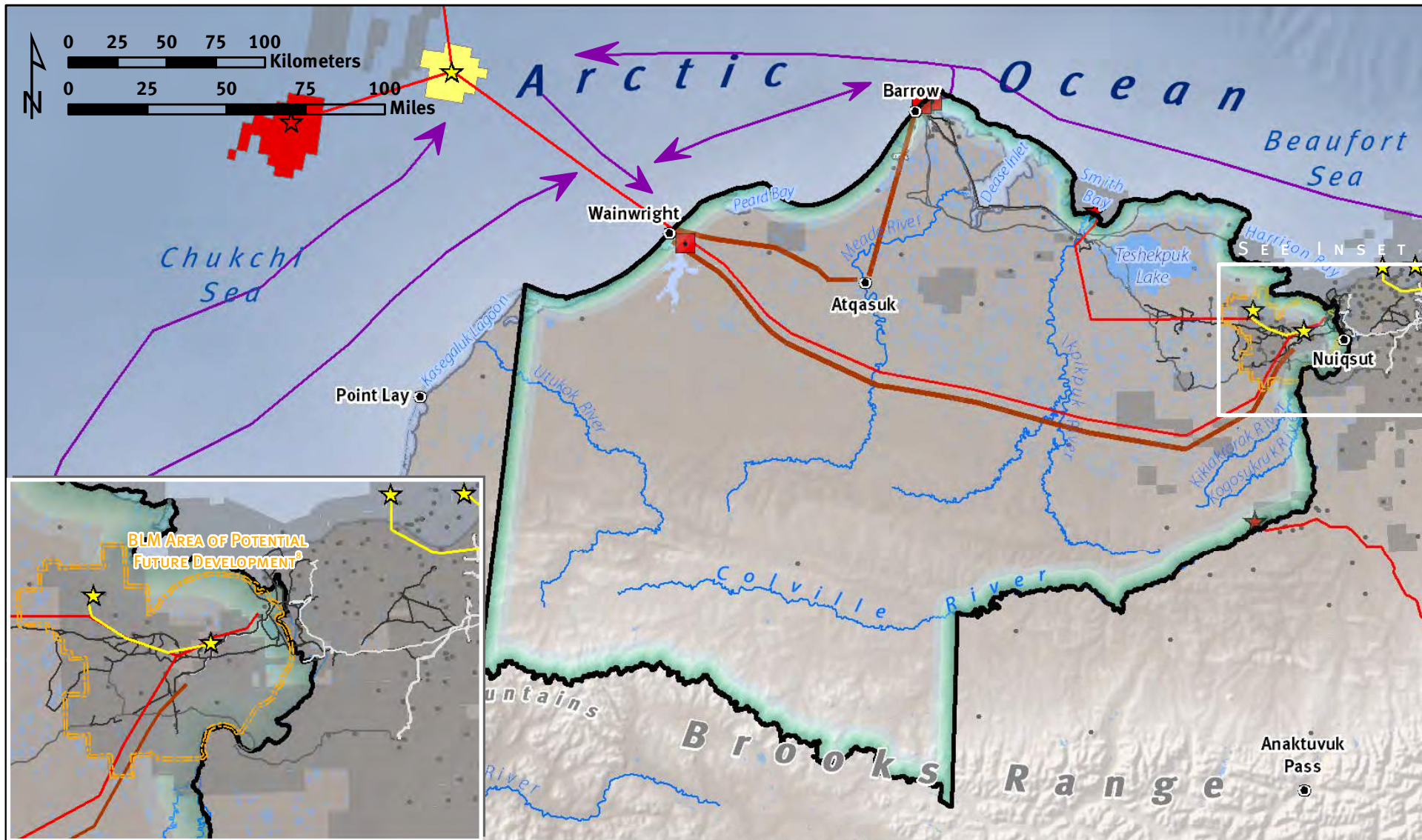




Sources: 1) Alaska Center for the Environment 2009; 2) AK DNR 2006; 3) BOEM 2016; 4) BLM 2016; 5) AK DNR 2016; 6) Oceana 2016; 7) BLM 2015; 8) AOGCC 2016.



# OIL AND GAS DEVELOPMENT SCENARIOS

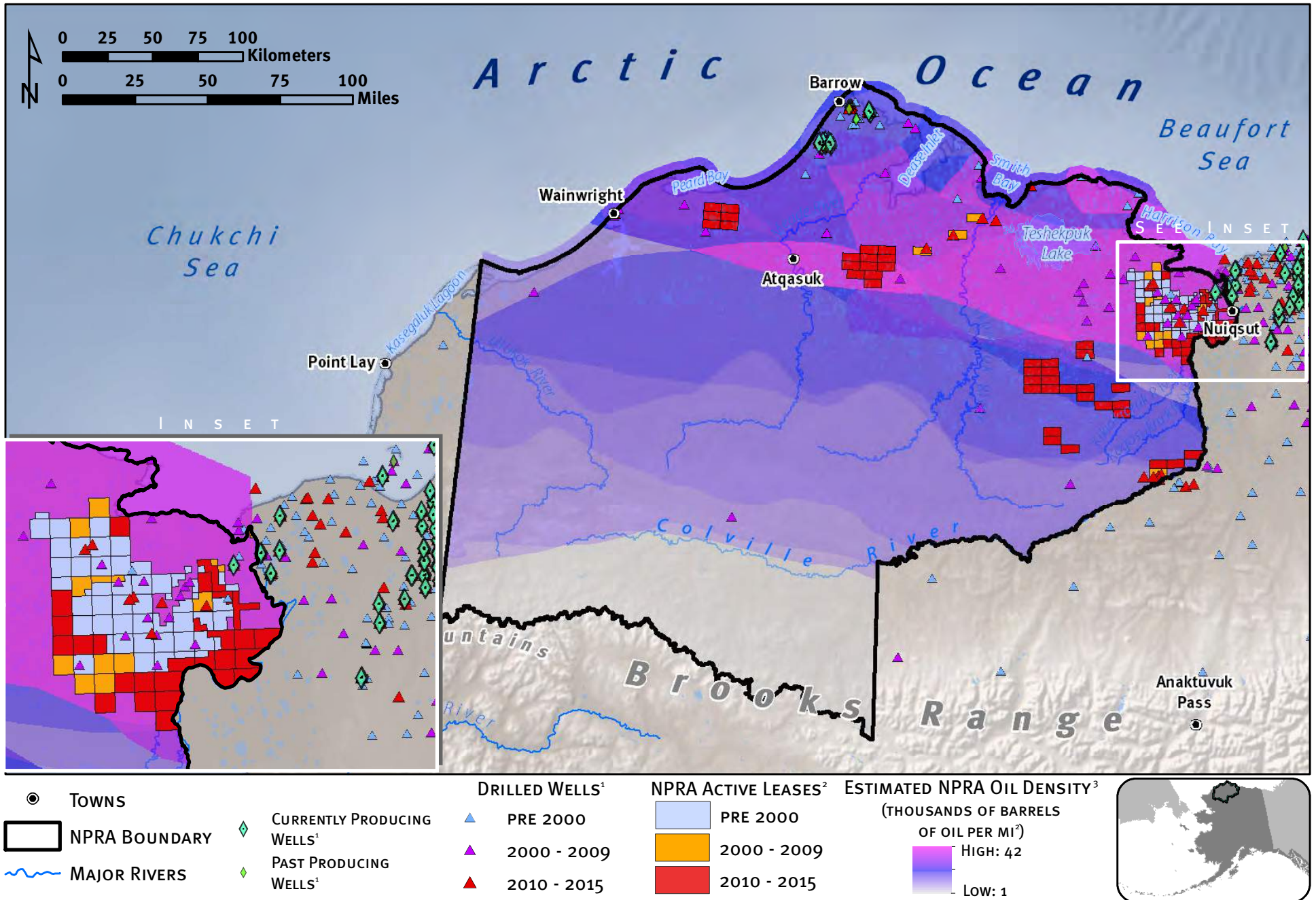


Sources: 1) Alaska Center for the Environment 2009; 2) BOEM 2016; 3) BLM 2016a; 4) AK DNR 2016; 5) Oceana 2016; 6) AOGCC 2016; 7) NSSI 2015; 8) BLM 2016b.

1:2,850,000



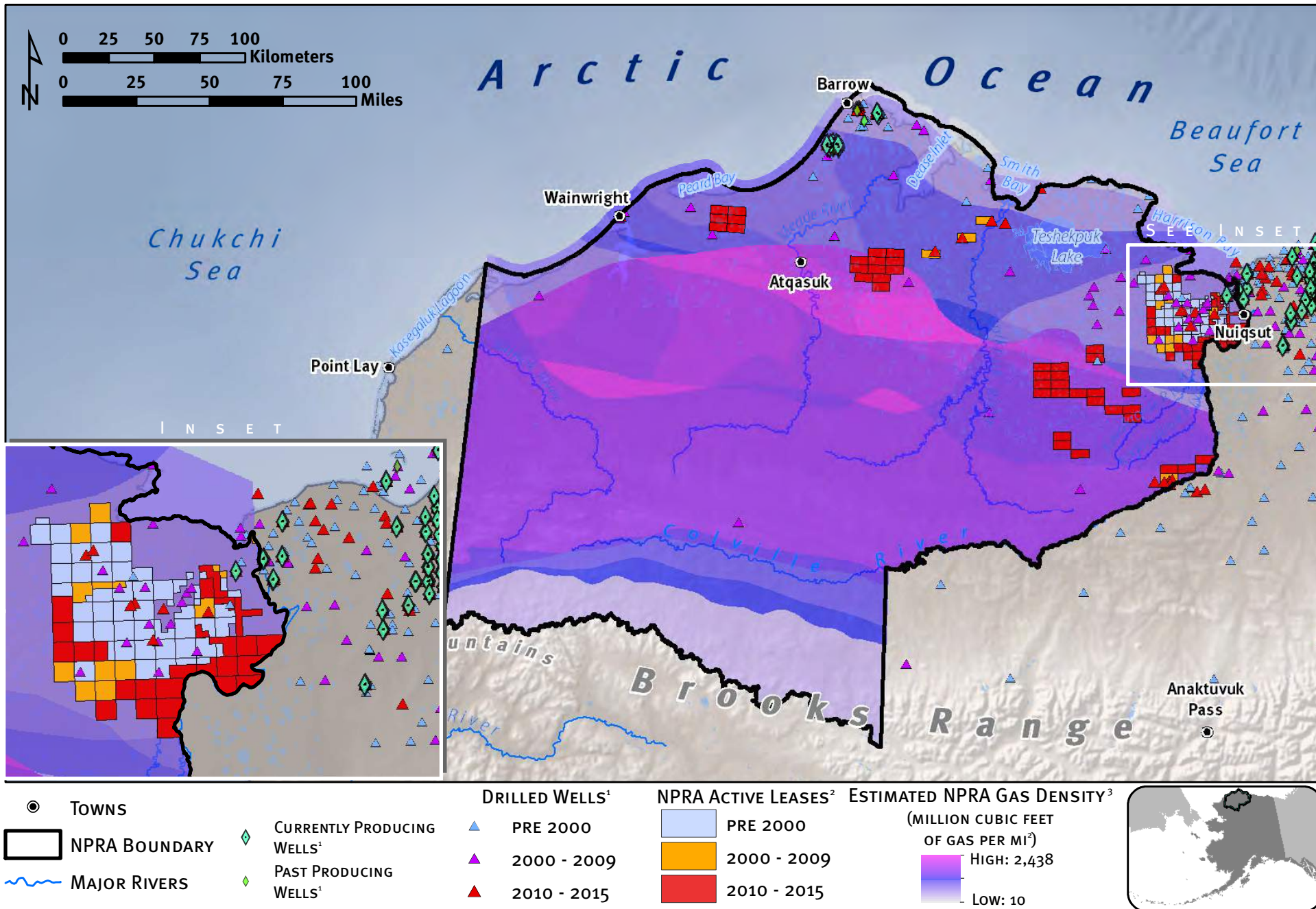
# O I L R E S O U R C E S



Sources: 1) AOGCC 2016; 2) BLM 2015; 3) Houseknecht et al. 2010.

1:2,850,000

# G A S R E S O U R C E S

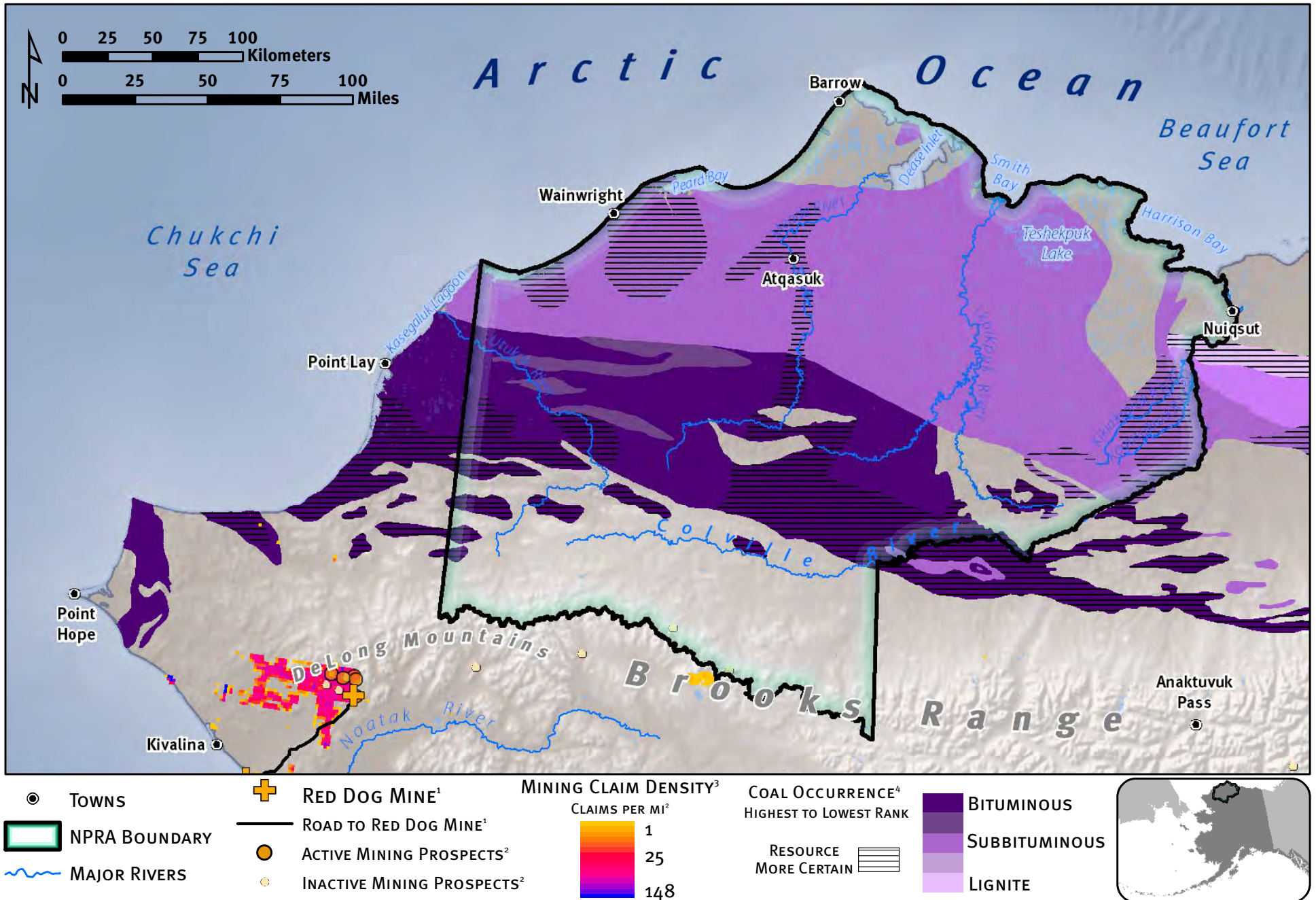


Sources: 1) AOGCC 2016; 2) BLM 2015; 3) Houseknecht et al. 2010.

1:2,850,000



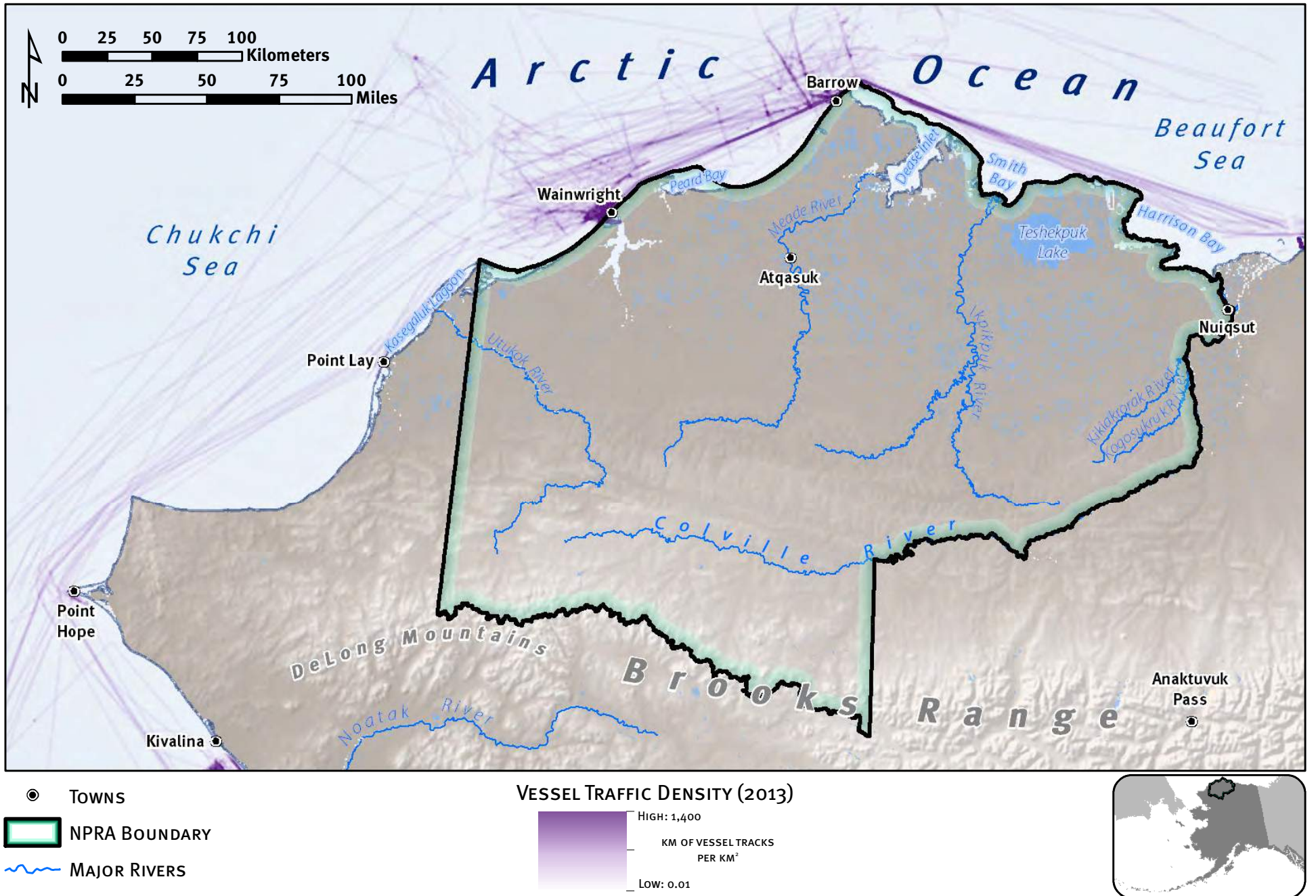
# MINING AND MINERAL RESOURCES



Sources: 1) Audubon Alaska 2015; 2) USGS 2008; 3) Causey 2007; 4) Stricker et al. 2011.

1:2,850,000

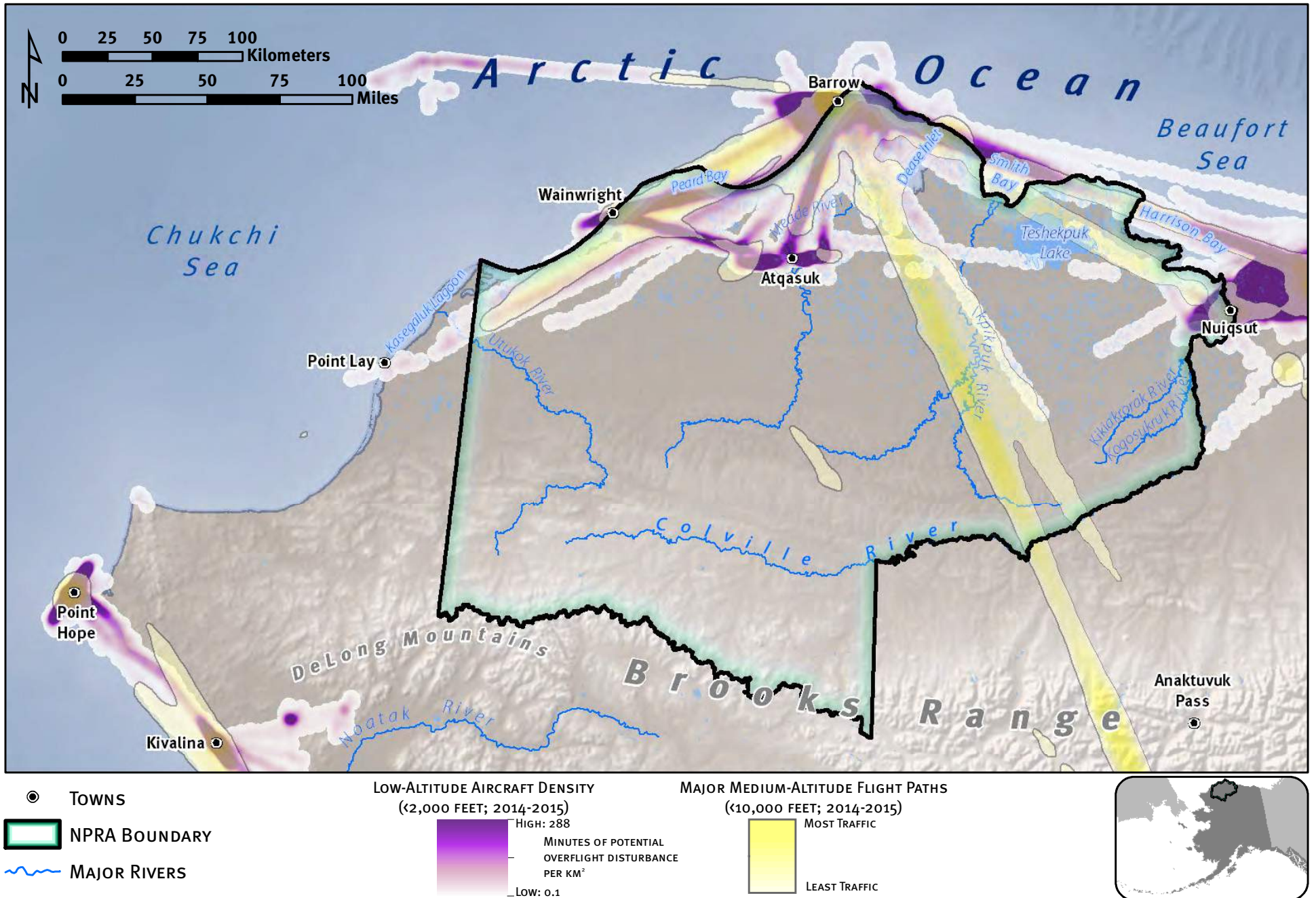
# V E S S E L T R A F F I C



Source: Audubon Alaska 2015, based on BOEM & NOAA 2013.



# LOW-ALTITUDE AIRCRAFT TRAFFIC



Source: Audubon Alaska 2016, based on Flight Aware 2015.

1:2,850,000

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### LIST OF DATA SOURCES BY MAP

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1. Context
2. Place Names and Geography  
Bing Maps Imagery, courtesy of NASA Earthstar Geographics.
3. Topography
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Smith and Walker 2014, based on Romanovsky and Marchenko 2014
5. Terrestrial Climate Change – Fraction of Precipitation Falling as Snow  
Smith and Walker 2014, based on SNAP 2013
6. Terrestrial Climate Change – Length of Growing Season  
Smith and Walker 2014, based on SNAP 2013
7. Terrestrial Climate Change – Precipitation  
Smith and Walker 2014, based on SNAP 2013
8. Terrestrial Climate Change – Air Temperature at Ground Surface  
Smith and Walker 2014, based on SNAP 2013
9. Terrestrial Climate Change – Cumulative Vulnerability  
Smith and Walker 2014, based on SNAP 2013 and Romanovsky and Marchenko 2014
10. Coastal Erosion
  - 1) Gibbs et al. 2015
  - 2) Gutierrez et al. 2014

#### Chapter 2: Biological Setting

11. Conservation Areas
  - 1) University of Montana 2015
  - 2) BOEM 2015
  - 3) BLM 2013
  - 4) Alaska DNR 2015
12. Conservation Priorities
  - 1) Audubon Alaska 2016
  - 2) Audubon Alaska 2011
  - 3) BLM 2013
  - 4) BOEM 2015
  - 5) Alaska DNR 2015
  - 6) University of Montana 2015



- 13. Ecoregions  
Nowacki et al. 2001
- 14. Vegetation  
NSSI 2013
- 15. Wetlands  
USFWS 2016

## Chapter 3: Fish

- 16. Fish Species Richness  
ADF&G 2015
- 17. Pacific Salmon Distribution  
ADF&G 2015
- 18. Fish Habitat
  - 1) North Pacific Fishery Management Council 2009
  - 2) USFWS 1977

## Chapter 4: Birds

- 19. Important Bird Areas  
Audubon Alaska 2014
- 20. Marine Bird Colonies and At-Sea Use Areas
  - 1) USFWS 2008
  - 2) Audubon Alaska 2016, based on Drew and Piatt 2013, Walker and Smith 2014, and USFWS 2016
- 21. Molting Goose Distribution  
USFWS 2015
- 22. Raptor Nest Sites in the NPRA  
Ritchie et al. 2003
- 23. Shorebirds
  - 1) Audubon Alaska 2014, based on USFWS 2014 and NPPSD 2013
  - 2) Audubon Alaska 2014
- 24. Watchlist Species
  - 1) Audubon Alaska 2014, based on USFWS 2014 and NPPSD 2013
  - 2) Audubon Alaska 2014
- 25. Arctic Tern
  - 1) Audubon Alaska 2014, based on USFWS 2014 and NPPSD 2013
  - 2) Audubon Alaska 2014
  - 3) USFWS 2010
- 26. Brant
  - 1) Audubon Alaska 2014, based on USFWS 2014 and NPPSD 2013
  - 2) Audubon Alaska 2014
  - 3) Alaska Biological Research 2002

27. Common Eider

- 1) Audubon Alaska 2014, based on USFWS 2014 and NPPSD 2013
- 2) Audubon Alaska 2014
- 3) USFWS 2003

28. Greater White-fronted Goose

- 1) Audubon Alaska 2014, based on USFWS 2014 and NPPSD 2003
- 2) Audubon Alaska 2014
- 3) USFWS 2010

29. King Eider

- 1) Oppel 2008
- 2) Oppel et al. 2009
- 3) Audubon Alaska 2014
- 4) Audubon Alaska 2014, based on USFWS 2014 and NPPSD 2013
- 5) USFWS 2010

30. Long-tailed Duck

- 1) Audubon Alaska 2014, based on USFWS 2014 and NPPSD 2013
- 2) Audubon Alaska 2014
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31. Northern Pintail

- 1) Audubon Alaska, based on USFWS 2014 and NPPSD 2013
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32. Pacific Loon

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33. Red-throated Loon

- 1) Audubon Alaska 2014, based on USFWS 2014 and NPPSD 2013
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- 3) USFWS 2010

34. Sabine's Gull

- 1) Audubon Alaska 2014, based on USFWS 2014 and NPPSD 2013
- 2) Audubon Alaska 2014
- 3) USFWS 2010

35. Spectacled Eider

- 1) Audubon Alaska 2014, based on USFWS 2014 and NPPSD 2013
- 2) Audubon Alaska 2014
- 3) USFWS 2001
- 4) Sexson et al. 2012
- 5) USFWS 2010

36. Steller's Eider

- 1) Audubon Alaska 2014, based on USFWS 2014 and NPPSD 2013
- 2) Audubon Alaska 2014

37. Yellow-billed Loon

- 1) Audubon Alaska 2014, based on USFWS 2014 and NPPSD 2013
- 2) Audubon Alaska 2014
- 3) USFWS 2010



## Chapter 5: Mammals

- 38. Seasonal Caribou Distribution
  - 1) Gotthardt et al. 2014
  - 2) Audubon Alaska 2014
- 39. Habitat Suitability by Season – Teshekpuk Caribou Herd
  - Wilson et al. 2012
- 40. Cetacean Biologically Important Areas
  - Clarke et al. 2015
- 41. Cetacean Distribution
  - Audubon Alaska and Oceana 2016, based on NOAA 2015.
- 42. Pinniped Distribution
  - 1) Audubon Alaska and Oceana 2016, based on NOAA 2015
  - 2) Robards et al. 2007
  - 3) NOAA 2014
  - 4) ADF&G 1997
  - 5) Huntington et al. 1999
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- 43. Polar Bear Denning and Feeding Areas
  - 1) NOAA 1988
  - 2) USFWS 1995
  - 3) Durner et al. 2010
  - 4) USFWS 2010
  - 5) Kalxdorff 1997

## Chapter 6: Human Uses

- 44. Subsistence Use
  - 1) ADF&G 2015.
  - 2) Table A (below).
- 45. Land Status and Ownership
  - DOI-BLM 2016.
- 46. Oil and Gas Development
  - 1) Alaska Center for the Environment 2009
  - 2) AK DNR 2006
  - 3) BOEM 2016
  - 4) BLM 2016
  - 5) Alaska DNR 2016
  - 6) Oceana 2016
  - 7) BLM 2015
  - 8) Alaska Oil and Gas Conservation Commission 2016

47. Oil and Gas Development Scenarios

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- 3) BLM 2016a
- 4) Alaska DNR 2016
- 5) Oceana 2016
- 6) Alaska Oil and Gas Conservation Commission 2016
- 7) NSSI 2015
- 8) BLM 2016b

48. Oil Resources

- 1) Alaska Oil and Gas Conservation Commission 2016
- 2) BLM 2015
- 3) Houseknecht et al. 2010

49. Gas Resources

- 1) Alaska Oil and Gas Conservation Commission 2016
- 2) BLM 2015
- 3) Houseknecht et al. 2010

50. Mining and Mineral Resources

- 1) Audubon Alaska 2015
- 2) USGS 2008
- 3) Causey 2007
- 4) Stricker et al. 2011

51. Vessel Traffic

Audubon Alaska 2015, based on data from BOEM and NOAA 2013

52. Low-Altitude Aircraft Traffic

Audubon Alaska 2016, based on data from FlightAware 2015



| Community                       |                | Source                     | Use Area (*=All Resources) |
|---------------------------------|----------------|----------------------------|----------------------------|
| North Slope Coastal Communities | Barrow         | Braund and Burnham 1984    | 1979-1983                  |
|                                 |                | Pedersen 1979              | Lifetime to 1979*          |
|                                 |                | SRB&A 2010a                | 1997-2006*                 |
|                                 |                | SRB&A and ISER 1993        | 1987-1989*                 |
|                                 |                | SRB&A and ISER Unpublished | 1987-1989*                 |
|                                 | Kaktovik       | SRB&A 2010a                | 1996-2006*                 |
|                                 | Nuiqsut        | Brown 1979                 | Pre-1979*                  |
|                                 |                | Pedersen 1979              | Lifetime to 1979*          |
|                                 |                | Pedersen 1986              | 1973-1986*                 |
|                                 |                | SRB&A 2003                 | 1994-2003*                 |
|                                 |                | SRB&A 2010a                | 1995-2006*                 |
|                                 |                | SRB&A 2010b                | 2008                       |
|                                 |                | SRB&A 2011                 | 2009                       |
|                                 |                | SRB&A 2012                 | 2010                       |
|                                 |                | SRB&A 2013a                | 2011                       |
|                                 | Point Lay      | SRB&A 2014                 | 1997-2006                  |
|                                 |                | Braund and Burnham 1984    | 1979-1983                  |
|                                 |                | Pedersen 1979              | Lifetime to 1979*          |
|                                 | Wainwright     | Pedersen 1979              | Lifetime to 1979*          |
|                                 |                | Braund and Burnham 1984    | 1979-1983                  |
| North Slope Inland Communities  | Anaktuvuk Pass | Pedersen 1979              | Lifetime to 1979*          |
|                                 |                | SRB&A 2003                 | 1994-2003*                 |
|                                 |                | SRB&A 2013b                | 2001-2010*                 |
|                                 | Atkasuk        | SRB&A 2003                 | 1994-2003*                 |
|                                 |                | Pedersen 1979              | Lifetime to 1979*          |
| Northwest Alaska Communities    | Shungnak       | Braund and Burnham 1984    | 1979-1983                  |
|                                 |                | Schroeder et al. 1987      | Lifetime to 1986*          |
|                                 |                | Schroeder et al. 1987      | Lifetime to 1985*          |
|                                 |                | Schroeder et al. 1987      | Lifetime to 1985*          |
|                                 |                | Schroeder et al. 1987      | Lifetime to 1986*          |
|                                 |                | Schroeder et al. 1987      | Lifetime to 1986*          |

Notes: The term "Lifetime" refers to use areas documented for the respondent's lifetime prior to the year of data collection. For example, "Lifetime to 1979" refers to the use areas utilized during the respondent's lifetime prior to 1979.

Table A (for Map 44: Subsistence Use). Data and table compiled by Stephen R. Braund & Associates, 2016.

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