U.S. Department of the Interior
Bureau of Land Management

Willow Master Development Plan

Supplemental Environmental Impact Statement

DRAFT

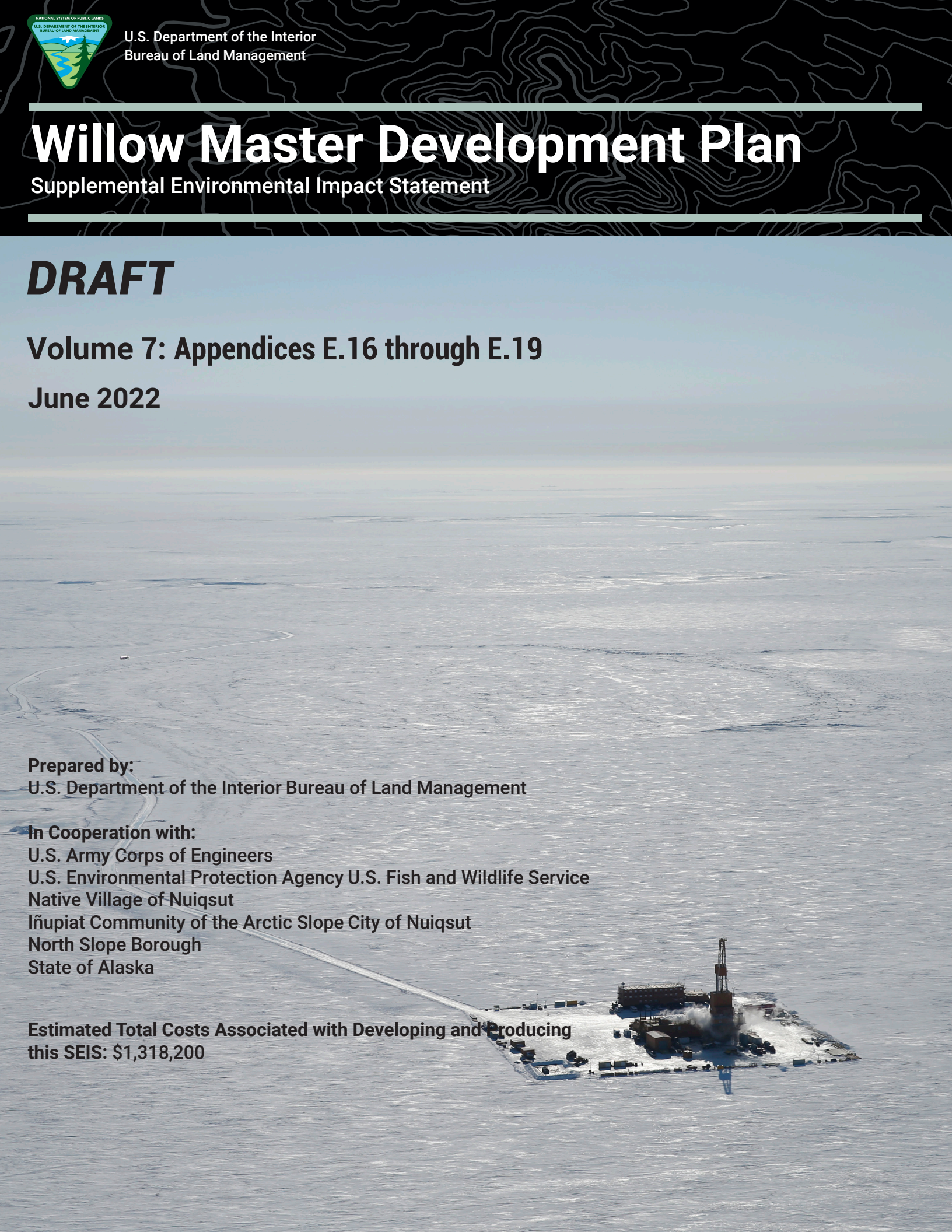
Volume 7: Appendices E.16 through E.19

June 2022

Prepared by:
U.S. Department of the Interior Bureau of Land Management

In Cooperation with:
U.S. Army Corps of Engineers
U.S. Environmental Protection Agency U.S. Fish and Wildlife Service
Native Village of Nuiqsut
Iñupiat Community of the Arctic Slope City of Nuiqsut
North Slope Borough
State of Alaska

Estimated Total Costs Associated with Developing and Producing this SEIS: $1,318,200



Mission

To sustain the health, diversity, and productivity of the public lands for the future use and enjoyment of present and future generations.

Cover Photo Illustration: North Slope Alaska oil rig during winter drilling.
Photo by: Judy Patrick, courtesy of ConocoPhillips.

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BLM/AK/PL-22/032+1610+F010

Willow Master Development Plan

Appendix E.16
Subsistence and Sociocultural Systems Technical Appendix

June 2022

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List of Acronyms

ATV	all-terrain vehicle
CRD	Colville River Delta
MDP	Master Development Plan
NSB	North Slope Borough
Project	Willow Master Development Plan Project
SRB&A	Stephen R. Braund and Associates

Glossary Terms

Direct effects analysis area – All subsistence use areas within 2.5 miles of Willow Master Development Plan Project infrastructure.

Household – One or more individuals living in one housing unit, whether or not they are related.

Subsistence – A traditional way of life in which wild renewable resources are obtained, processed, and distributed for household and community consumption according to prescribed social and cultural systems and values.

Subsistence use areas – The geographic extent of a resident's or community's use of the environment to conduct traditional subsistence activities.

1.0 SUBSISTENCE USES AND PRACTICES, NUIQSUT AND UTQIAĠVIK

This appendix provides detailed data tables, figures, and discussion related to Nuiqsut and Utqiaġvik (Barrow) **subsistence** uses. The Willow Master Development Plan (MDP) Final Environmental Impact Statement defines the analysis area for subsistence and sociocultural systems as all areas used for subsistence activities by the communities of Nuiqsut and Utqiaġvik. These study communities were selected because they both have documented use near the Willow MDP Project (Project) and would be most likely to experience direct and indirect effects to subsistence uses. The following sections provide a brief introduction to Iñupiat subsistence harvesting patterns followed by a description of each community's **subsistence use areas**, harvest and use data, timing of subsistence activities, travel methods, and resource importance.

1.1 Introduction

The Iñupiat are an Alaska Native people whose territory extends throughout northwest and northern Alaska. Archaeological research indicates that humans have occupied northern Alaska for roughly 14,000 years (Kunz and Reanier 1996). At the time of European contact, the North Slope was inhabited by two indigenous Iñupiat populations: the Tagiugmiut and the Nunamiut. The Tagiugmiut ("people of the sea") inhabited coastal areas of the Arctic Coastal Plain and relied primarily on harvests of marine mammals, terrestrial mammals (mainly caribou), and fish. The Nunamiut ("people of the land") inhabited the interior, including the Brooks Range and Arctic foothills areas, and relied mostly on terrestrial mammals and fish, with caribou comprising the majority of their subsistence harvests. Being located on or near the coast, the study communities of Nuiqsut and Utqiaġvik were traditionally inhabited by the Tagiugmiut. The Iñupiat remain the primary occupants of the North Slope today and continue the traditions of their ancestors, including hunting, harvesting, and sharing wild resources. Subsistence activities tend to occur near communities, along rivers and coastlines, or at particularly productive sites where resources are known to occur seasonally. Residents often conduct subsistence activities from camps located in areas that provide access to multiple resources throughout the year. Harvesters apply traditional knowledge, which is passed down through generations and learned through experience on the land, to determine the locations, timing, and methods for their subsistence activities. Relevant traditional knowledge includes knowledge about the distribution, migration, and seasonal variation of animal populations and other environmental factors such as tides, currents, ice, and snow conditions.

Prior to the 1950s, when mandatory school attendance and economic factors such as a decline in fur prices compelled families to permanently settle in centralized communities, the Iñupiat were seminomadic and ranged over large geographic areas for trapping, fishing, gathering, and hunting activities. Contemporary subsistence use areas include many of these traditional use areas. Certain harvest locations are used infrequently or by a small number of harvesters; however, these places may still be important to a community if they are particularly productive areas or if they have cultural, historical, or familial significance to the user. As an example, while the Prudhoe Bay development area is no longer part of the contemporary use area of the Nuiqsut people, residents continue to identify with the area as part of their traditional territory due to its historical use by their ancestors. Like other communities on the North Slope, Nuiqsut and Utqiaġvik have a "mixed, subsistence-market" economy (Walker and Wolfe 1987), where families invest money into small-scale, efficient technologies to harvest wild foods. In recent years, the advent of snow machines and all-terrain vehicles (ATVs), including four-wheelers, has reduced the time required to travel to traditional hunting and harvesting areas but has also increased the need for cash employment to purchase, maintain, and procure supplies for the new equipment, a hallmark of the mixed cash economy (Ahtuangaruak 1997; Impact Assessment Inc. 1990a, 1990b; SRB&A and ISER 1993; Worl and Smythe 1986).

While the use of camps and cabins continues, residents of the North Slope today more commonly use their communities as a base from which they conduct same-day subsistence activities (Impact Assessment Inc. 1990a; SRB&A 2010b, 2017a).

1.2 Subsistence Overview

1.2.1 Nuiqsut

Nuiqsut is located on the Nigliq Channel of the Colville River, in an area that provides abundant opportunities for the subsistence harvesting of terrestrial mammals, marine mammals, fish, and waterfowl. Although the location is less advantageous for marine mammal harvests than some other North Slope communities that are located directly on the coast, the Beaufort Sea is easily accessible via the Nigliq Channel. The Colville River is the largest river system on the North Slope and supports the largest overwintering areas for whitefish, which local residents harvest in substantial quantities (Craig 1987; Seigle, Gutierrez et al. 2016).

The Nuiqsut area was traditionally a gathering place where Iñupiat and Athabascan people gathered to trade and fish, maintaining connections between the Nunamiut and the Tagiugmiut (Brown 1979). After the 1971 passage of the Alaska Native Claims Settlement Act, 27 Iñupiat families from Barrow (since renamed Utqiaġvik) resettled at Nuiqsut to live a more traditional lifestyle and to reclaim their ancestral ties to the area (Impact Assessment Inc. 1990b). The site was selected primarily for its easy access to the main channel of the Colville River for fishing and hunting and for the ease of movement between upriver hunting sites and downriver whaling and sealing sites (Brown 1979).

Today, according to the most recent U.S. Census in 2020, Nuiqsut has a population of 512 residents living in 130 occupied **households** (USCB 2021). Primary sources of employment in the community include the village corporation (Kuukpik Corporation), the North Slope Borough (NSB), and the NSB school district (NSB 2018). Nuiqsut is one of 11 Alaska Eskimo bowhead whaling communities. It is the closest community to the major oil-producing fields of the North Slope, which have resulted in impacts to subsistence and sociocultural systems (SRB&A 2009, 2017a, 2018) but also provide jobs, corporate dividends, and local revenue. During winter, Nuiqsut residents have seasonal access to the Dalton Highway via Alpine, Kuparuk, and Prudhoe Bay development roads. This access allows residents to travel to Fairbanks and Anchorage to purchase subsistence equipment and supplies, including boats, snow machines, firearms, and ammunition at reduced cost.

1.2.1.1 Subsistence Use Areas

Figure E.16.1 depicts Nuiqsut subsistence use areas for all resources over multiple historic and contemporary time periods (BLM 2004; Brown, Braem et al. 2016; Pedersen 1979, 1986; SRB&A 2010b). Use areas from all these studies overlap with portions of the Project area. Lifetime (pre-1979) use areas show Nuiqsut residents using a large area centered on the community to harvest subsistence resources; reported use areas extended offshore approximately 15 miles, as far east as Camden Bay, south along the Itkillik River, and west as far as Teshekpuk Lake. Subsequent use area data show Nuiqsut residents traveling across a progressively larger area to harvest subsistence resources. Use areas for the 1995–2006 time period document Nuiqsut residents traveling beyond Atqasuk in the west, offshore more than 50 miles northeast of Cross Island, overland to Cape Halkett and Utqiaġvik in the north, to Camden Bay in the east, and beyond the Colville River in the south. The majority of these use areas are concentrated around the Colville River, in areas to the southwest of the community, offshore areas north of the Colville River Delta (CRD), and northeast of Cross Island. Use areas for other time periods (1973–1986; 2014) are generally within the extent of the Pedersen (1979) and Stephen R. Braund and Associates (SRB&A) (2010b) use areas described above. SRB&A (2010b) notes that for the 1995–2006 time period, wolf and wolverine use areas continued farther south toward Anaktuvuk Pass but were not documented due to the extent of the map used during interviews.

Nuiqsut subsistence use areas for individual resources are shown on Figures E.16.2 through E.16.9 for the time periods listed above, in addition to the 2008–2019 time period (SRB&A 2021) for caribou only. Nuiqsut subsistence use areas for large land mammals are shown on Figures E.16.2 through E.16.4. Nuiqsut caribou use areas are shown on Figure E.16.2. As indicated on the figure, areas consistently used by Nuiqsut residents for caribou hunting are in an overland area between the Ikpikpuk and Kuparuk rivers, north to the coast, and south along the Colville River. The maximum extent of the use areas

documented among all the studies extends from Atqasuk in the west toward Point Thomson in the east and south along the Colville and Anaktuvuk rivers to Anaktuvuk Pass. SRB&A's (2010b) overlapping use areas show that the greatest number of caribou use areas are concentrated along the Colville River and CRD, along the Itkillik River, and overland to the west and south of the community; these areas generally correspond to the caribou hunting areas reported during the 2008–2019 study years (SRB&A 2021).

Nuiqsut moose use areas (Figure E.16.3) show residents' consistent use of areas adjacent to the Colville River for moose harvests. While lifetime (pre-1979) use areas were completely confined to the Colville River, more recent moose use areas have expanded to include other tributaries such as the Chandler and Anaktuvuk rivers and Fish (Uvlutuuq) Creek. Moose use areas for the 1995–2006 time period show the highest amount of overlapping use along the Colville River south of Nuiqsut as far as Umiat. Figure E.16.4 depicts Nuiqsut grizzly bear use areas for the lifetime and 1973–1986 time periods, including areas along the Colville River watershed from Fish (Iqalliqpik) Creek to Umiat.

Nuiqsut furbearer and small land mammal use areas are shown on Figure E.16.5. Lifetime (pre-1979) use areas show residents using overland areas near the community, as well as the more southern Colville, Chandler, Anaktuvuk, Itkillik, and Kuparuk rivers, to harvest small land mammals. Subsequent studies, including those for the 1973–1986 and 1995–2006 time periods, depict an expansion from previously recorded use areas. SRB&A's (2010b) wolf and wolverine use areas for the 1995–2006 time period extend to the Meade River in the west and beyond the Dalton Highway in the east, including a single-use area that extends east to just south of Kaktovik. Small land mammal use areas for the most recent available use area study show less use to the east and west of the community and more use south into the Brooks Range.

Nuiqsut fishing areas from multiple time periods (Figure E.16.6) indicate consistent use of the Colville River and smaller tributaries, including the Itkillik, Chandler, and Anaktuvuk rivers as well as Fish and Judy (Kayyaaq) creeks. Contemporary use areas extend somewhat father along the Colville and Itkillik rivers as well as along Fish Creek.

Nuiqsut use areas for birds (Figure E.16.7) are mostly concentrated along the Colville River and nearby overland areas for various time periods, although they also include offshore eider hunting areas extending from Cape Halkett to Camden Bay. Lifetime (pre-1979) wildfowl use areas are generally located near the Colville River and in nearshore locations extending east to Prudhoe Bay. More recent goose and eider use areas (1994–2003 and 1995–2006 time periods) occur in a somewhat larger area and include areas offshore and east of Prudhoe Bay to Camden Bay. The most recent documentation of bird use areas for the 2014 time period shows them to be north of the community and offshore into Harrison Bay.

Figure E.16.8 displays Nuiqsut use areas for vegetation for several time periods and shows use of the Colville River as far south as Umiat and areas near Fish (Uvlutuuq) Creek for harvests of vegetation and berries. In addition, berry gathering areas were documented along the Itkillik, Chandler, and Anaktuvuk rivers during a study for the 1994–2003 time period.

Nuiqsut marine mammal use areas (Figure E.16.9) show use of the Beaufort Sea and CRD at varying extents, depending on the time period. Lifetime Nuiqsut use areas for marine mammals included offshore areas from Atigaru Point to Kaktovik at distances of less than 20 miles; subsequent studies documented use areas extending to Cape Halkett in the west and varying distances to the east. SRB&A's (2010b) use areas showed Nuiqsut residents harvesting marine mammals up to 40 miles offshore to the north of the community and even farther offshore (approximately 60 miles) in an area near Cross Island, a sandy barrier island used traditionally and currently as a base of operations for Nuiqsut whaling crews. Nuiqsut 2001–2016 bowhead whale hunting global positioning system tracks extend as far east as Flaxman Island and over 30 miles offshore from Cross Island.

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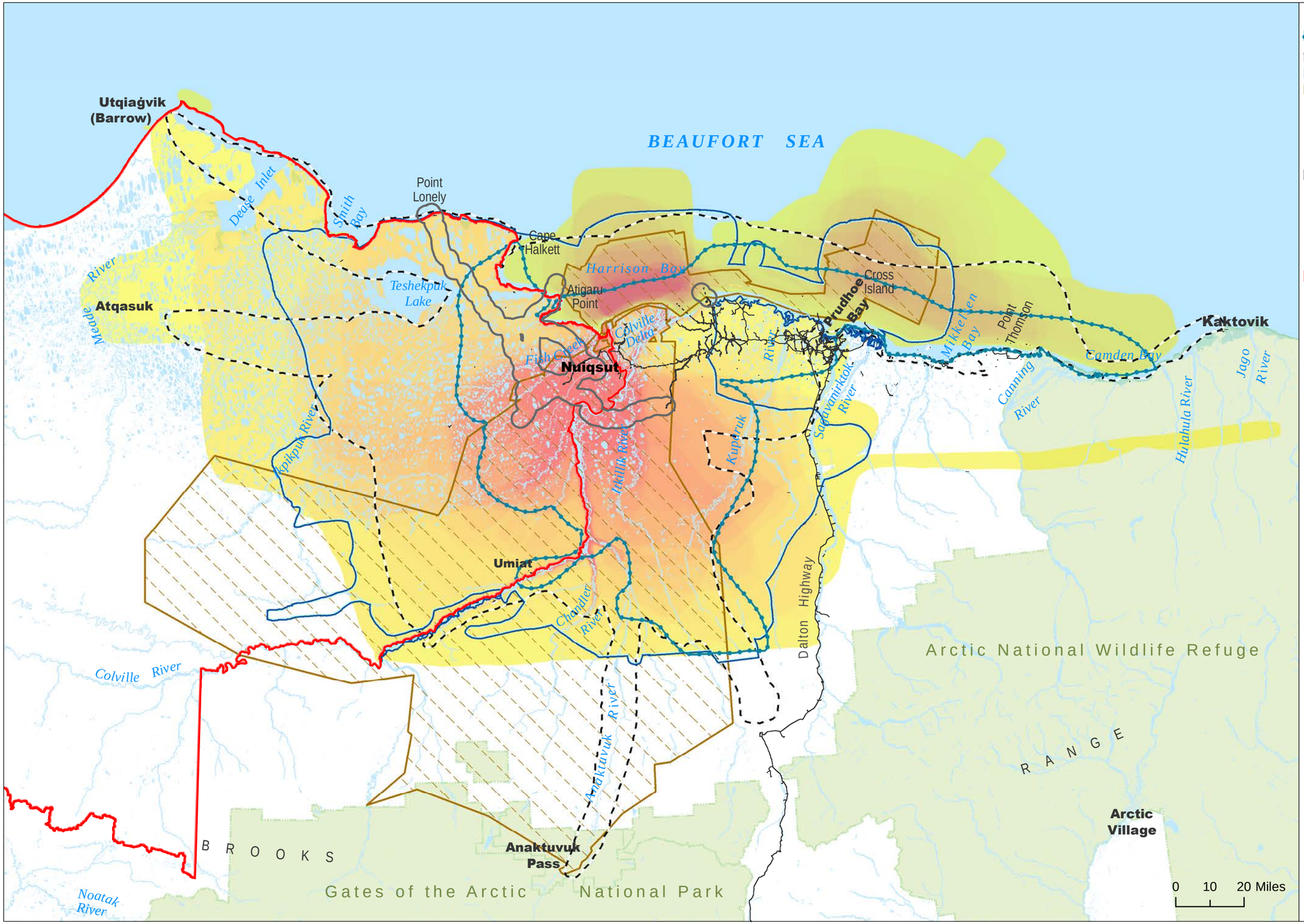

Subsistence Data

- All Resources, Lifetime Previous to 1979 [a]
- All Resources, 1973-1986 [b]
- All Resources, 1994-2003 [c]
- All Resources, 2014 [d]
- Overlapping Subsistence Use Areas All Resources, 1995-2006 [e] (High / Low)

Willow Proposed Development Features

- Direct Effects Area

Other Infrastructure

- Existing Road
- Existing Pipeline
- Existing Infrastructure

Land Designation

- National Petroleum Reserve in Alaska

Map prepared by
Stephen R. Braund & Associates

Source
a. Pedersen 1979
b. Pedersen 1986
c. BLM 2004
d. Brown et al. 2016
e. SRB&A 2010a

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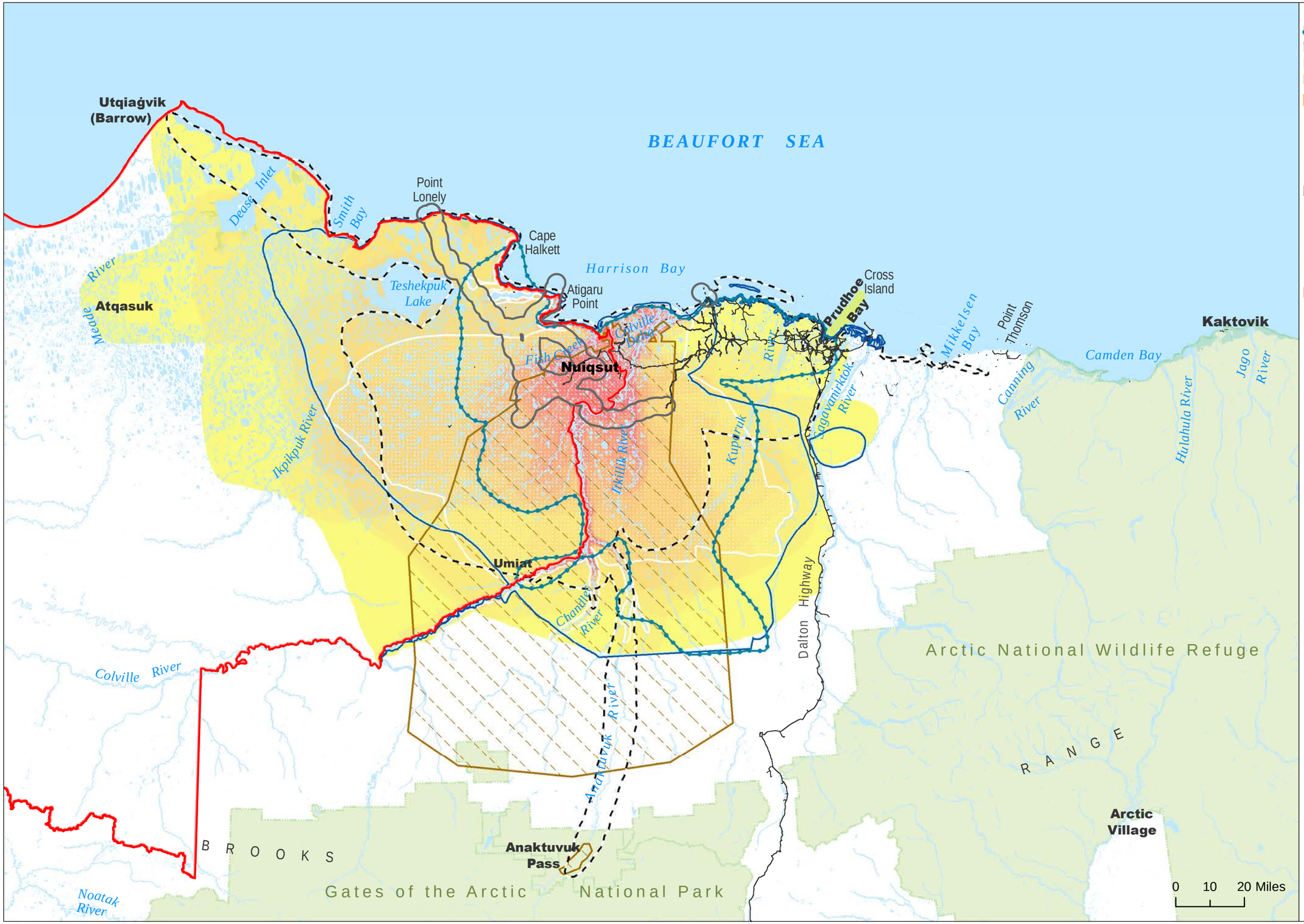
Figure E.16.1



Subsistence Data

- Caribou, Lifetime prior to 1979 [a]
- Caribou, 1973-1986 [b]
- Caribou, 1994-2003 [c]
- Caribou, 2014 [d]
- Caribou, January 2008 - December 2019 [e]
- Overlapping Subsistence Use Areas Caribou, 1995-2006 [f] (High / Low)

Willow Proposed Development Features

- Direct Effects Area

Other Infrastructure

- Existing Road
- Existing Pipeline
- Existing Infrastructure

Land Designation

- National Petroleum Reserve in Alaska

Map prepared by
Stephen R. Braund & Associates

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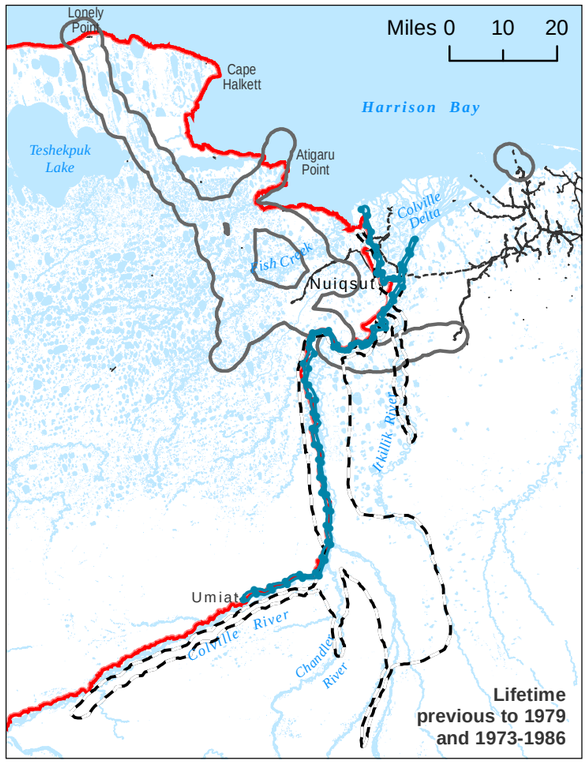
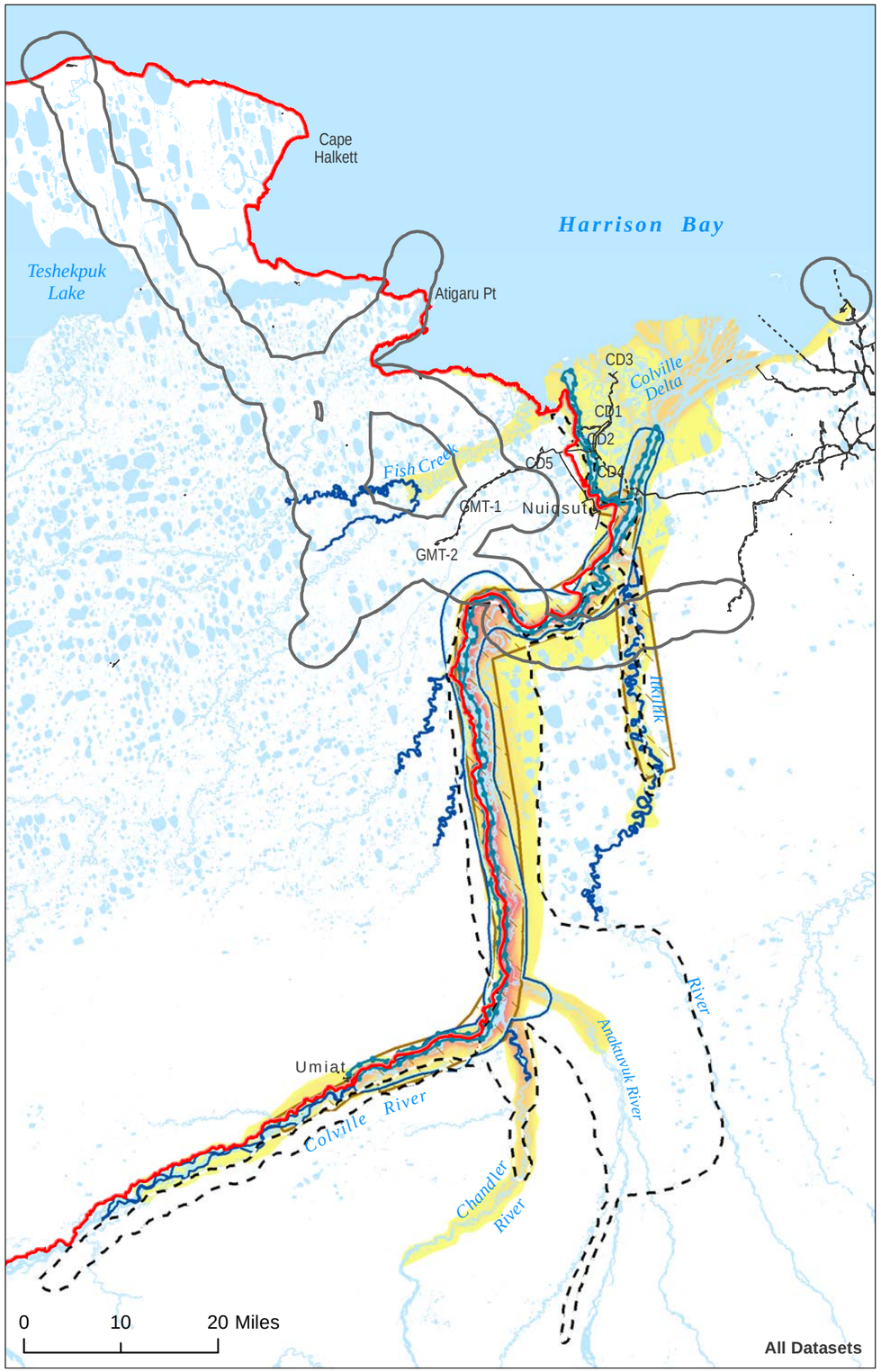
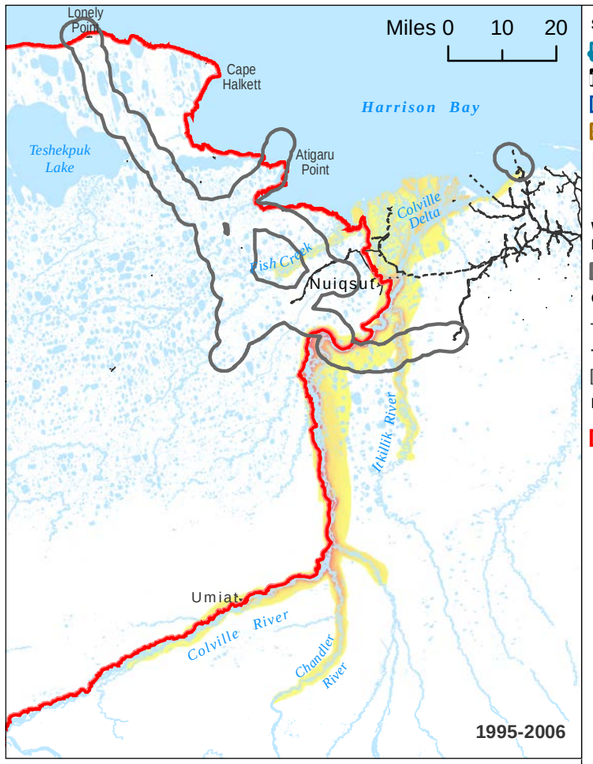
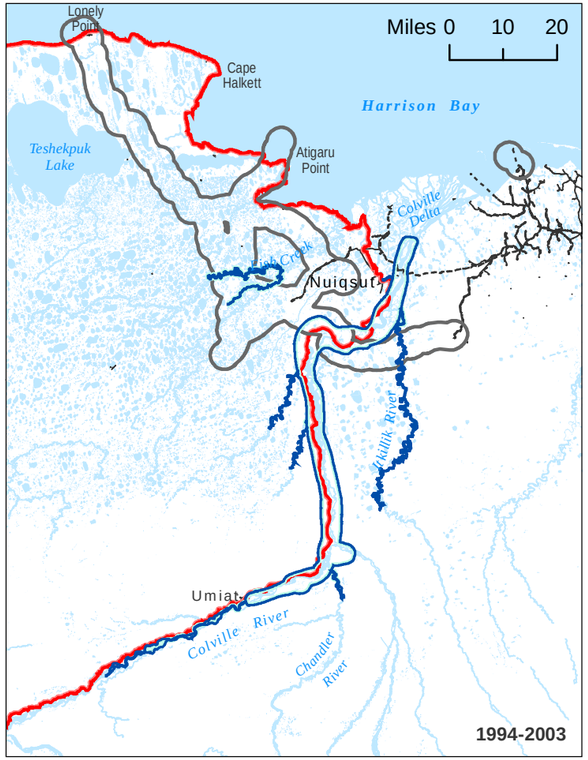
b. Pedersen 1986
c. BLM 2004
d. Brown et al. 2016
e. SRB&A 2021
f. SRB&A 2010a

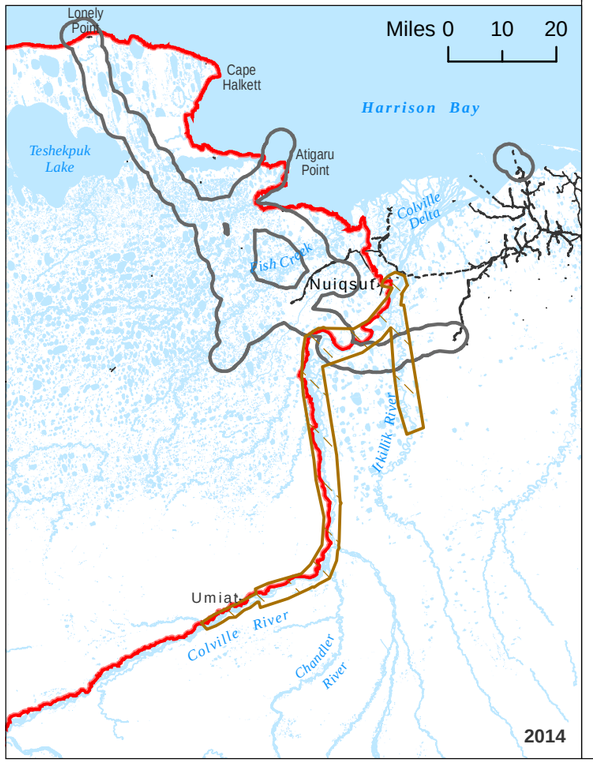
Figure E.16.2











Subsistence Data

- Moose, Lifetime previous to 1979 [a]
- Moose, 1973-1986 [b]
- Moose, 1994-2003 [c]
- Moose, 2014 [d]
- Overlapping Subsistence Use Areas Moose, 1995-2006 [e] (High / Low)

Willow Proposed Development Features

- Direct Effects Area

Other Infrastructure

- Existing Road
- Existing Pipeline
- Existing Infrastructure

Land Designation

- National Petroleum Reserve in Alaska

Map prepared by
Stephen R. Braund & Associates

Source
a. Pedersen 1979
b. Pedersen 1986
c. BLM 2004
d. Brown et al. 2016
e. SRB&A 2010a

Figure E.16.3

Subsistence Data

- Grizzly Bear, Lifetime previous to 1979 [a]
- Grizzly Bear, 1973-1986 [b]

Willow Proposed Development Features

- Direct Effects Area

Other Infrastructure

- Existing Road
- Existing Pipeline
- Existing Infrastructure

Land Designation

- National Petroleum Reserve in Alaska

Map prepared by
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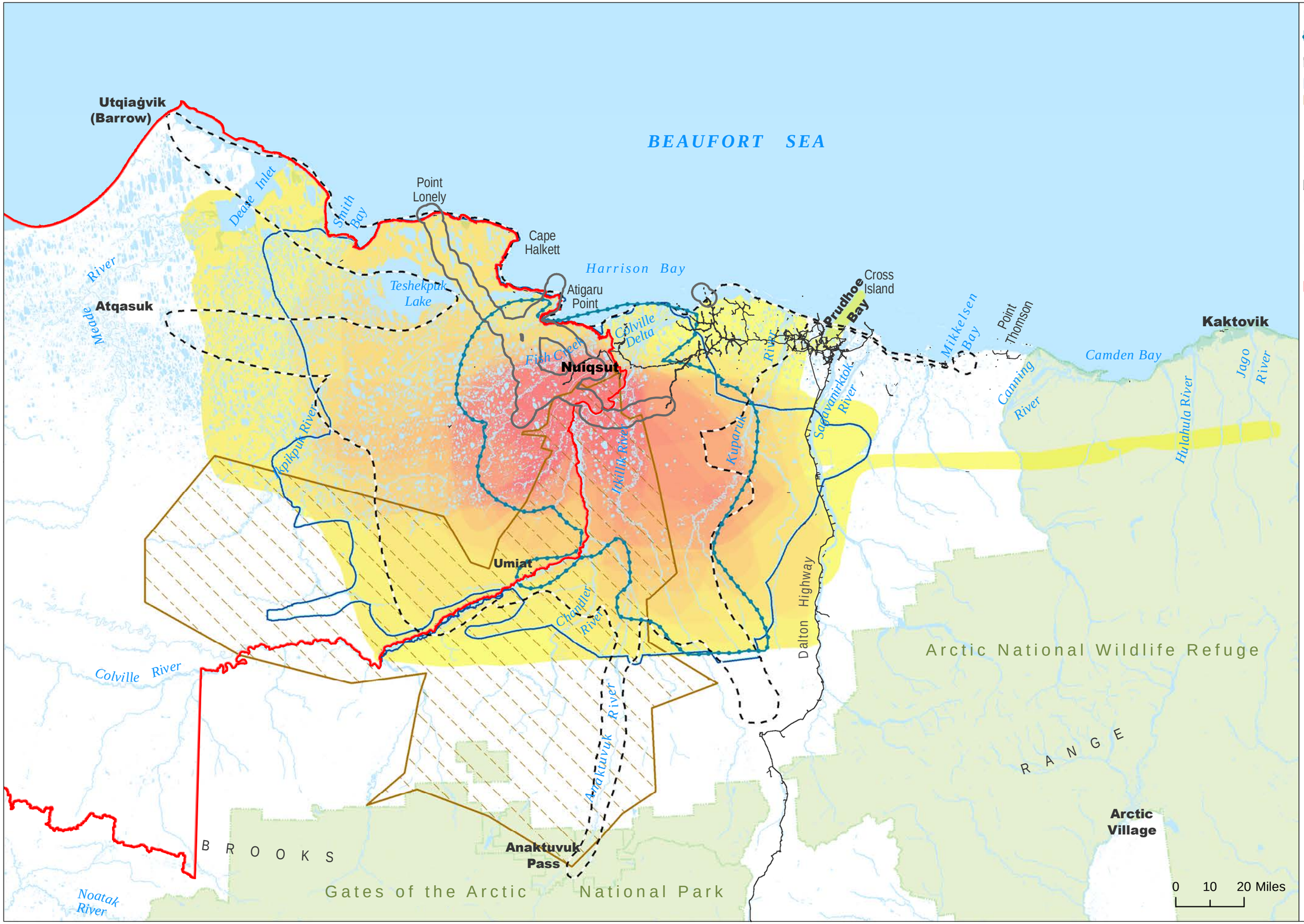
Source
a. Pedersen 1979
b. Pedersen 1986

Figure E.16.4



Subsistence Data

- Furbearer and Trapping, Lifetime previous to 1979 [a]
- Furbearers and Small Land Mammals, 1973-1986 [b]
- Wolf and Wolverine, 1994-2003 [c]
- Small Land Mammals, 2014 [d]
- Overlapping Subsistence Use Areas, Wolf and Wolverine, 1995-2006 [e] (High / Low)

Willow Proposed Development Features

- Direct Effects Area

Other Infrastructure

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- Existing Pipeline
- Existing Infrastructure

Land Designation

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Map prepared by
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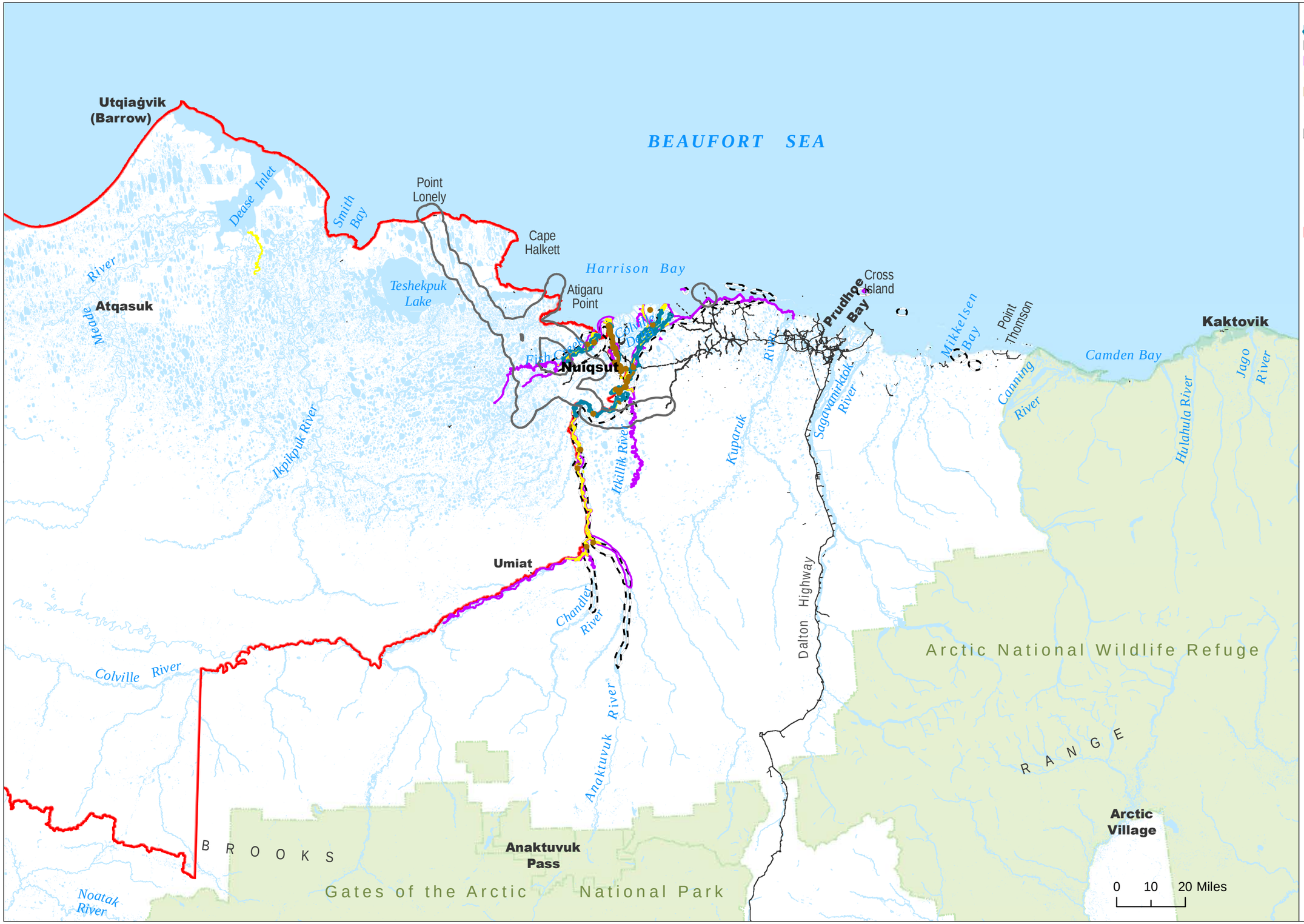
Figure E.16.5



Subsistence Data
- Fishing, Lifetime previous to 1979 [a]
- Fish, 1973-1986 [b]
- Fish, 1994-2003 [c]
- Fish, 1995-2006 [d]
- Fish, 2014 [e]

Willow Proposed Development Features
- Direct Effects Area

Other Infrastructure
- Existing Road
- Existing Pipeline
- Existing Infrastructure

Land Designation
- National Petroleum Reserve in Alaska

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Source
a. Pedersen 1979
b. Pedersen 1986
c. BLM 2004
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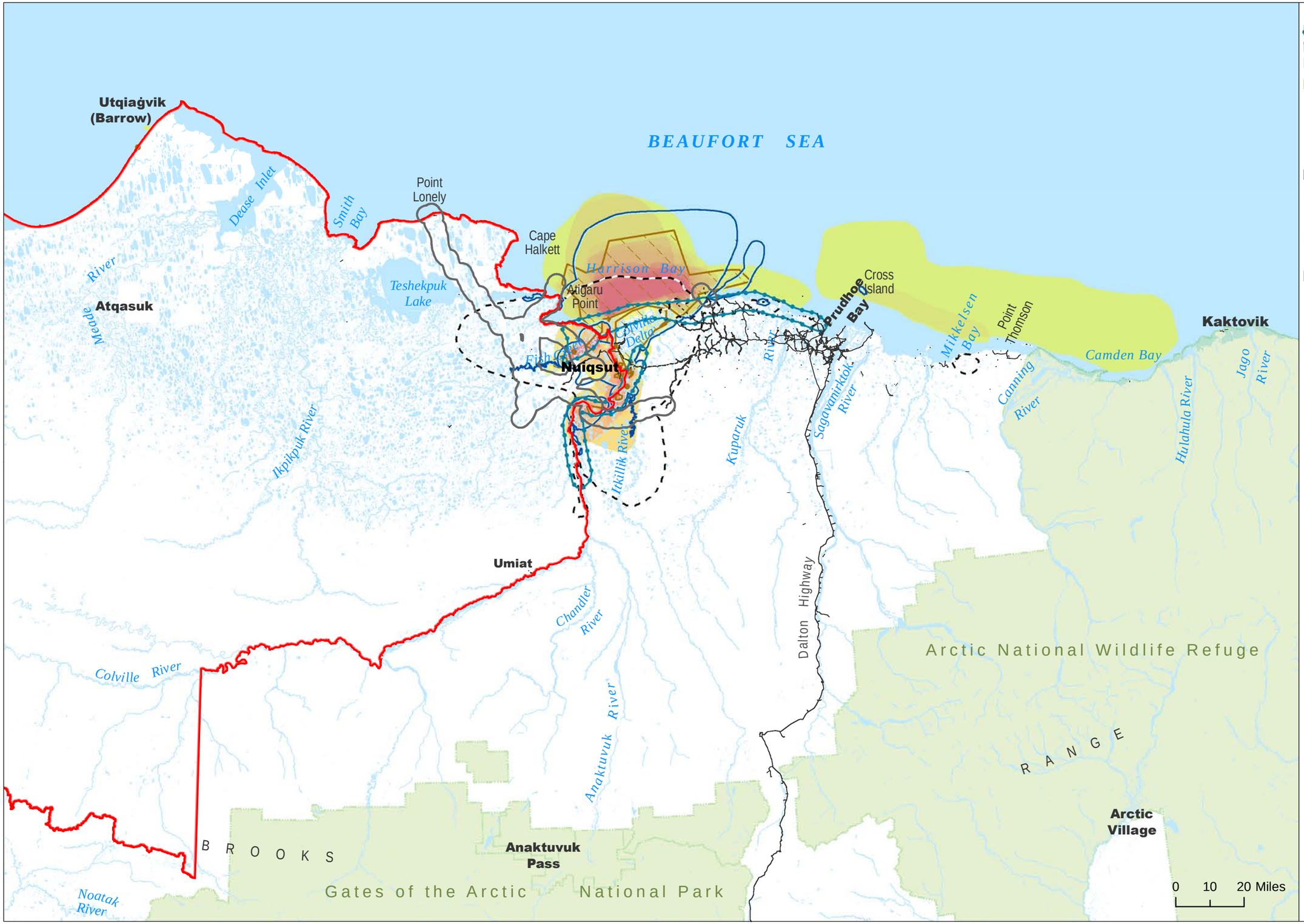

Subsistence Data

- Wildfowl, Lifetime previous to 1979 [a]
- Wildfowl, 1973-1986 [b]
- Eider and Geese, 1994-2003 [c]
- Ducks, Geese, Eggs and Upland Birds, 2014 [d]
- Overlapping Subsistence Use Areas Eider and Geese, 1995-2006 [e] (High / Low)

Willow Proposed Development Features

- Direct Effects Area

Other Infrastructure

- Existing Road
- Existing Pipeline
- Existing Infrastructure

Land Designation

- National Petroleum Reserve in Alaska

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Source
a. Pedersen 1979
b. Pedersen 1986
c. BLM 2004
d. Brown et al. 2016
e. SRB&A 2010a

Figure E.16.7

Subsistence Data
- Vegetation, 1973-1986 [a]
- Berries, 1994-2003 [b]
- Berries and Plants, 2014 [c]

Willow Proposed Development Features
- Direct Effects Area

Other Infrastructure
- Existing Road
- Existing Pipeline
- Existing Infrastructure

Land Designation
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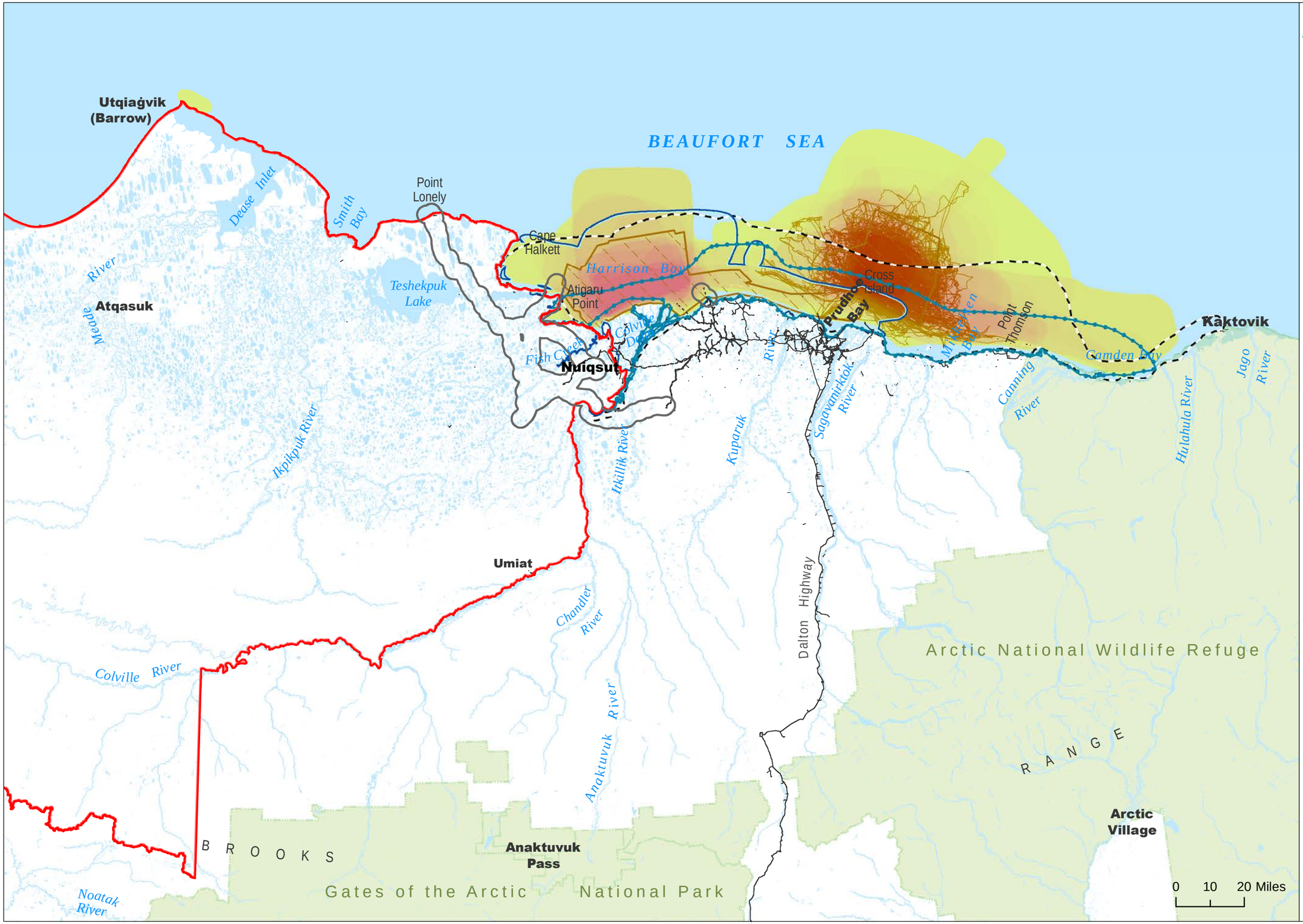

Subsistence Data

- Marine Mammals, Lifetime previous to 1979 [a]
- Marine Mammals, 1973-1986 [b]
- Seal, 1994-2003 [c]
- Marine Mammals, 2014 [d]
- Whale Hunting GPS Track, 2001-2016 [e]
- High / Low — Overlapping Subsistence Use Areas Marine Mammals, 1995-2006 [f]

Willow Proposed Development Features

- Direct Effects Area

Other Infrastructure

- Existing Road
- Existing Pipeline
- Existing Infrastructure

Land Designation

- National Petroleum Reserve in Alaska

Map prepared by
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Source
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b. Pedersen 1986
c. BLM 2004
d. Brown et al. 2016
e. Galginaitis 2017
f. SRB&A 2010a

Figure E.16.9

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1.2.1.1.1 Direct Effects Analysis Area

Subsistence use of the **direct effects analysis area**, defined as the area within 2.5 miles of Project infrastructure, is relatively high. Analyses specific to the direct effects analysis area are based primarily on *Subsistence Mapping of Nuiqsut, Kaktovik, and Barrow* for the 1995-2006 time period (SRB&A 2010b) and the Nuiqsut Caribou Subsistence Monitoring Project for the 2008-2019 time period (SRB&A 2010a, 2011, 2012, 2013, 2014, 2015, 2016, 2017a, 2018; SRB&A 2019, 2020, 2021). For the 1995–2006 time period, use areas overlapping the direct effects analysis area accounted for 40% of all use areas documented for Nuiqsut harvesters (Table E.16.1). Across 12 years of the Nuiqsut Caribou Subsistence Monitoring Project (2008–2019), over half (53%) of the caribou use areas overlapped the direct effects analysis area. Areas located within the direct effects analysis area include overland areas to the west, south, and southeast of the community; coastal boating areas to the west and east of the CRD; and riverine boating areas along the Colville and Itkillik rivers and Fish (Uvlutuuq and Iqalliqpik) Creek.

Table E.16.1. Nuiqsut Use Areas within the Direct Effects Analysis Area*

Source	Resource Type	Time Period	Total Number of Use Areas	Number (%) of Use Areas in Direct Effects Analysis Area
SRB&A 2010b	All resources	1995–2006	758	304 (40%)
SRB&A 2010a, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021	Caribou	2008–2019	2,161	1,145 (53%)

As shown in Figures E.16.1 through E.16.9, Nuiqsut harvesters have reported using the direct effects analysis area to harvest the following resources during one or more study years: caribou, moose, other large land mammals, furbearers and small land mammals, fish, birds, vegetation, and marine mammals. Resources that overlap during most study years include caribou, furbearers and small land mammals, fish, and marine mammals. While some resources overlap with a large proportion of the direct effects analysis area (e.g., caribou, furbearers and small land mammals), others overlap with smaller portions of the area, such as where the direct effects analysis area intersects with fishing or hunting areas along Fish (Iqalliqpik) Creek and the Colville River (e.g., fish, birds) or in offshore waters near Atigaru Point or Oliktok Point (e.g., marine mammals).

1.2.1.2 Harvest and Use Data

Tables E.16.2 and E.16.3 provide Nuiqsut harvest data for various years between 1985 and 2019; data are not available for all years within this time period because harvest studies were not conducted in all years. While certain studies address all resources (all resources study years), others address individual species or resources (single-resource study years). Eleven study years only include data on caribou harvests (Braem, Kaleak et al. 2011; SRB&A 2012, 2013, 2014, 2015, 2016, 2017a, 2018; SRB&A 2019, 2020, 2021) (Table E.16.3). During available study years, Nuiqsut households have harvested between 399 (in 1985, one of two years when the community did not successfully harvest a bowhead whale) and 896 (in 2014) pounds of subsistence resources per capita (Table E.16.2). Land mammals, marine mammals, and fish are all major subsistence resources in Nuiqsut. During 4 study years, marine mammals contributed more total edible pounds than any other resource. Non-salmon fish were the top harvested resource during the remaining 3 study years and accounted for between 173 (in 1985) and 248 (in 1993) edible pounds per capita during years with per capita harvest data. Large land mammals were generally the second- or third-most harvested resource during all study years and provided between 169 (in 1985) and 261 (in 2014) edible pounds per capita. Nuiqsut residents harvest other resources such as migratory birds, upland game birds, salmon, bird eggs, and vegetation in much smaller quantities. Small land mammals are also harvested, but because they are harvested primarily for their fur, they contribute little in the way of edible pounds.

In terms of species, bowhead whales, whitefish (Arctic cisco, or *qaaktaq*, and broad whitefish), and caribou are the primary subsistence species harvested in Nuiqsut. Bowhead whale harvests have accounted for between 28.7% and 60.3% of the total harvest during all study years (except for 1985 and 1994–1995, when Nuiqsut did not successfully harvest a bowhead whale) (Table E.16.3). Arctic cisco harvests have accounted for between 1.9% and 14.9% of the total harvest; broad whitefish have accounted

for between 5.3% and 45% of the total harvest; and caribou have accounted for between 21.7% and 37.5% of the total harvest. Other subsistence species with substantial contributions to Nuiqsut subsistence harvests include moose, seals, goose, Arctic grayling, least cisco, and burbot.

Data on subsistence participation and use by Nuiqsut households are available for various study years (Tables E.16.2 and E.16.3). As shown in Table E.16.2, 100% of households report using subsistence resources during study years, and over 90% of households participate in subsistence activities (i.e., attempting to harvest). Across all study years, participation in subsistence activities was highest for non-salmon fish, large land mammals, and migratory birds. Specifically, in 2014, over half of Nuiqsut households participated in harvests of caribou, broad whitefish, white-fronted goose, cloudberries, and Arctic cisco. In 2019, 98% of households participated in caribou hunting activities. Sharing of subsistence resources, a core Iñupiat value, is also high among Nuiqsut households; between 95% and 100% of households report receiving subsistence foods during available study years. In particular, households commonly share marine mammals (between 95% and 100% of households receiving), large land mammals (between 70% and 92% receiving), and non-salmon fish (between 71% and 90% receiving).

Table E.16.2. Nuiqsut Subsistence Harvest Estimates by Resource Category, All Resources Study Years

Study Year	Resource	Percentage of Households Use (%)	Percentage of Households Try to Harvest (%)	Percentage of Households Harvest (%)	Percentage of Households Give (%)	Percentage of Households Receive (%)	Estimated Harvest Number[a]	Estimated Harvest Total Pounds[b]	Estimated Harvest Average Household Pounds	Estimated Harvest Per Capita Pounds	Percentage of Total Harvest (%)
1985	All resources	100	98	98	95	100	–	160,035	2,106	399	100.0
1985	Salmon	60	43	40	23	23	441	1,366	18	3	0.9
1985	Non-salmon fish	100	93	93	83	75	67,712	69,243	911	173	43.3
1985	Large land mammals	98	90	90	80	70	536	67,621	890	169	42.3
1985	Small land mammals	65	63	58	23	13	688	245	3	1	0.2
1985	Marine mammals	100	48	23	30	100	59	13,355	176	33	8.3
1985	Migratory birds	90	90	85	60	55	1,733	6,626	87	17	4.1
1985	Upland game birds	88	88	88	58	13	1,957	1,370	18	3	0.9
1985	Bird eggs	25	25	23	8	10	262	40	1	<1	<0.1
1985	Vegetation	38	50	18	10	20	–	169	2	<1	0.1
1992[c]	All resources	–	–	–	–	–	–	150,195	–	–	100.0
1992[c]	Salmon	–	–	–	–	–	6	65	–	–	0.0
1992[c]	Non-salmon fish	–	74	–	–	–	36,701	51,890	–	–	34.5
1992[c]	Large land mammals	–	–	–	–	–	299	41,386	–	–	27.6
1992[c]	Small land mammals	–	–	–	–	–	46	1	–	–	0.0
1992[c]	Marine mammals	–	–	–	–	–	49	52,865	–	–	35.2
1992[c]	Migratory birds	–	–	–	–	–	1,105	3,655	–	–	2.4
1992[c]	Upland game birds	–	–	–	–	–	378	265	–	–	0.2
1992[c]	Eggs	–	–	–	–	–	25	4	–	–	<0.1
1992[c]	Vegetation	–	32	–	–	–	–	66	–	–	<0.1

Study Year	Resource	Percentage of Households Use (%)	Percentage of Households Try to Harvest (%)	Percentage of Households Harvest (%)	Percentage of Households Give (%)	Percentage of Households Receive (%)	Estimated Harvest Number[a]	Estimated Harvest Total Pounds[b]	Estimated Harvest Average Household Pounds	Estimated Harvest Per Capita Pounds	Percentage of Total Harvest (%)
1993	All resources	100	94	90	92	98	–	267,818	2,943	742	100.0
1993	Salmon	71	45	36	39	47	272	1,009	11	3	0.4
1993	Non-salmon fish	97	79	79	87	90	71,626	89,481	983	248	33.4
1993	Large land mammals	98	76	74	82	92	691	87,306	959	242	32.6
1993	Small land mammals	53	45	42	27	18	599	84	1	<1	<0.1
1993	Marine mammals	97	58	37	79	97	113	85,216	936	236	31.8
1993	Migratory birds	87	74	73	63	65	2,238	3,540	39	10	1.3
1993	Upland game birds	60	45	45	42	26	973	681	7	2	0.3
1993	Eggs	40	21	19	15	23	346	104	1	<1	<0.1
1993	Vegetation	79	71	71	27	40	–	396	4	1	0.1
1994–1995[d]	All resources	–	–	–	–	–	–	83,228	–	–	100.0
1994–1995[d]	Salmon	–	–	–	–	–	10	31	–	–	<0.1
1994–1995[d]	Non-salmon fish	–	–	–	–	–	15,190	46,569	–	–	56.0
1994–1995[d]	Large land mammals	–	–	–	–	–	263	32,686	–	–	39.3
1994–1995[d]	Small land mammals	–	–	–	–	–	42	0	–	–	0.0
1994–1995[d]	Marine mammals	–	–	–	–	–	25	1,504	–	–	1.8
1994–1995[d]	Migratory birds	–	–	–	–	–	569	2,289	–	–	2.8
1994–1995[d]	Upland game birds	–	–	–	–	–	58	58	–	–	0.1
1994–1995[d]	Vegetation	–	–	–	–	–	14	91	–	–	0.1
1995–1996	All resources	–	–	–	–	–	–	183,576	–	–	100.0
1995–1996	Salmon	–	–	–	–	–	42	131	–	–	0.1
1995–1996	Non-salmon fish	–	–	–	–	–	10,612	16,822	–	–	9.2
1995–1996	Large land mammals	–	–	–	–	–	364	43,554	–	–	23.7
1995–1996	Small land mammals	–	–	–	–	–	27	0	–	–	0.0
1995–1996	Marine mammals	–	–	–	–	–	178	120,811	–	–	65.8
1995–1996	Migratory birds	–	–	–	–	–	683	2,166	–	–	1.2
1995–1996	Upland birds	–	–	–	–	–	19	13	–	–	<0.1
1995–1996	Vegetation	–	–	–	–	–	12	78	–	–	<0.1
2000–2001	All resources	–	–	–	–	–	–	183,246	–	–	100.0
2000–2001	Salmon	–	–	–	–	–	10	75	–	–	<0.1
2000–2001	Non-salmon fish	–	–	–	–	–	26,545	27,933	–	–	15.2
2000–2001	Large land mammals	–	–	–	–	–	504	62,171	–	–	33.9
2000–2001	Small land mammals	–	–	–	–	–	108	2	–	–	<0.1
2000–2001	Marine mammals	–	–	–	–	–	31	87,929	–	–	48.0
2000–2001	Migratory birds	–	–	–	–	–	1,192	5,108	–	–	2.8
2000–2001	Upland birds	–	–	–	–	–	23	16	–	–	<0.1
2000–2001	Vegetation	–	–	–	–	–	2	13	–	–	<0.1

Study Year	Resource	Percentage of Households Use (%)	Percentage of Households Try to Harvest (%)	Percentage of Households Harvest (%)	Percentage of Households Give (%)	Percentage of Households Receive (%)	Estimated Harvest Number[a]	Estimated Harvest Total Pounds[b]	Estimated Harvest Average Household Pounds	Estimated Harvest Per Capita Pounds	Percentage of Total Harvest (%)
2014	All resources	100	95	90	91	97	–	371,992	3,444	896	100.0
2014	Salmon	64	41	40	31	35	–	3,889	36	9	1.0
2014	Non-salmon fish	93	78	71	72	71	–	85,106	788	205	22.9
2014	Large land mammals	91	66	64	67	72	–	108,359	1,003	261	29.1
2014	Small land mammals	17	16	10	2	7	–	0	0	0	0.0
2014	Marine mammals	95	55	40	71	95	–	169,367	1,568	408	45.5
2014	Migratory birds	79	71	66	52	38	–	4,742	44	11	1.3
2014	Upland birds	16	12	12	9	5	–	78	1	<1	<0.1
2014	Vegetation	67	55	53	21	38	–	414	4	1	0.1

Source: 1985 (ADF&G 2018); 1992 (Fuller and George 1999); 1993 (Pedersen 1995a); 1994–1995 (Brower and Hepa 1998); 1995–1996, 2000–2001 (Bacon, Hepa et al. 2009); 2014 (Brown, Braem et al. 2016)

Note: "–" (No Data). "All Resources" study years are years where studies addressed all subsistence resources harvested by the community, rather than selected resources or species. The estimated harvest numbers for the 1994–1995, 1995–1996, and 2000–2001 data were derived by summing individual species in each resource category. Also for those study years, total pounds were derived from conversion rates found at ADF&G (2018), and total (usable) pounds for bowhead whales were calculated based on the method presented in SRB&A and ISER (1993). These estimates do not account for whale girth and should be considered approximate; more exact methods for estimating total whale weights are available in George, Philo et al. (n.d.).

[a] Estimated numbers represent individuals in all cases except vegetation, where they represent gallons.

[b] Estimated pounds include only edible pounds and therefore do not include estimates for resources that are not typically eaten by community residents (e.g., furbearers).

[c] The estimated pounds of moose harvested in 1992 is likely too high (Fuller and George 1999).

[d] The 1994–1995 study year underrepresents the harvest of Arctic cisco and humpback whitefish (Brower and Hepa 1998); Nuiqsut did not successfully harvest a bowhead whale in 1994–1995.

Table E.16.3. Nuiqsut Subsistence Harvest Estimates by Selected Species, All Study Years*

Study Year	Resource[a]	Percentage of Households Use (%)	Percentage of Households Try to Harvest (%)	Percentage of Households Harvest (%)	Percentage of Households Give (%)	Percentage of Households Receive (%)	Estimated Harvest Number[b]	Estimated Harvest Total Pounds[c]	Estimated Harvest Average Household Pounds	Estimated Harvest Per Capita Pounds	Percentage of Total Harvest (%)
1985	Caribou	98	90	90	80	60	513	60,021	790	150	37.5
1985	Cisco	98	75	73	65	60	46,478	29,354	386	73	18.3
1985	Broad whitefish	95	80	78	70	40	7,900	26,861	353	67	16.8
1985	Bowhead whale	100	23	5	8	100	0	7,458	98	19	4.7
1985	Moose	40	40	18	20	25	13	6,650	88	17	4.2
1985	White-fronted goose	90	90	85	55	48	1,340	6,028	79	15	3.8
1985	Arctic grayling	78	65	63	48	35	4,055	3,650	48	9	2.3
1985	Humpback whitefish	48	45	38	33	13	4,345	3,476	46	9	2.2
1985	Arctic char	75	63	60	33	35	1,060	2,969	39	7	1.9
1985	Burbot	75	60	60	43	33	669	2,675	35	7	1.7
1985	Bearded seal	48	25	15	15	35	15	2,675	35	7	1.7
1985	Ringed seal	53	25	18	23	40	40	1,676	22	4	1.0
1992	Bowhead whale	–	–	–	–	–	2	48,715	–	–	32.4
1992	Caribou	–	81	–	–	–	278	32,551	–	–	21.7
1992	Arctic cisco	–	–	–	–	–	22,391	22,391	–	–	14.9
1992	Broad whitefish	–	–	–	–	–	6,248	15,621	–	–	10.4
1992	Moose[d]	–	–	–	–	–	18	8,835	–	–	5.9

Study Year	Resource[a]	Percentage of Households Use (%)	Percentage of Households Try to Harvest (%)	Percentage of Households Harvest (%)	Percentage of Households Give (%)	Percentage of Households Receive (%)	Estimated Harvest Number[b]	Estimated Harvest Total Pounds[c]	Estimated Harvest Average Household Pounds	Estimated Harvest Per Capita Pounds	Percentage of Total Harvest (%)
1992	Humpback whitefish	–	–	–	–	–	1,802	4,504	–	–	3.0
1992	Arctic char	–	–	–	–	–	1,544	4,324	–	–	2.9
1992	Bearded seal	–	–	–	–	–	16	2,760	–	–	1.8
1992	Arctic grayling	–	–	–	–	–	3,114	2,491	–	–	1.7
1992	Canada goose	–	–	–	–	–	319	1,437	–	–	1.0
1993	Caribou	98	74	74	79	79	672	82,169	903	228	30.7
1993	Bowhead whale	97	37	5	76	97	3	76,906	845	213	28.7
1993	Broad whitefish	90	66	66	65	66	12,193	41,455	456	115	15.5
1993	Arctic cisco	89	69	68	81	60	45,237	31,666	348	88	11.8
1993	Ringed seal	65	42	31	40	55	98	7,277	80	20	2.7
1993	Burbot	79	63	57	53	55	1,416	5,949	65	16	2.2
1993	Moose	69	47	10	29	63	9	4,403	48	12	1.6
1993	Arctic grayling	79	69	65	44	27	4,515	4,063	45	11	1.5
1993	Least cisco	63	52	47	36	27	6,553	3,277	36	9	1.2
1994–1995[e]	Broad whitefish	–	–	–	–	–	3,237	37,417	–	–	45.0
1994–1995[e]	Caribou	–	–	–	–	–	258	30,186	–	–	36.3
1994–1995[e]	Arctic cisco	–	–	–	–	–	9,842	6,889	–	–	8.3
1994–1995[e]	Moose	–	–	–	–	–	5	2,500	–	–	3.0
1994–1995[e]	Goose, unidentified	–	–	–	–	–	474	2,133	–	–	2.6
1994–1995[e]	Ringed seal	–	–	–	–	–	24	1,008	–	–	1.2
1995–1996	Bowhead whale	–	–	–	–	–	4	110,715	–	–	60.3
1995–1996	Caribou	–	–	–	–	–	362	42,354	–	–	23.1
1995–1996	Broad whitefish	–	–	–	–	–	2,863	9,735	–	–	5.3
1995–1996	Ringed seal	–	–	–	–	–	155	6,527	–	–	3.6
1995–1996	Arctic cisco	–	–	–	–	–	5,030	3,521	–	–	1.9
1995–1996	Bearded seal	–	–	–	–	–	17	2,974	–	–	1.6
1995–1996	Least cisco	–	–	–	–	–	1,804	1,804	–	–	1.0
1999–2000	Caribou	–	–	–	–	–	413	–	–	112	–
2000–2001	Bowhead whale	–	–	–	–	–	4	86220	–	–	47.1
2000–2001	Caribou	–	–	–	–	–	496	57,985	–	–	31.6
2000–2001	Arctic cisco	–	–	–	–	–	18,222	12,755	–	–	7.0
2000–2001	Broad whitefish	–	–	–	–	–	2,968	10,092	–	–	5.5
2000–2001	White-fronted goose	–	–	–	–	–	787	3,543	–	–	1.9
2000–2001	Moose	–	–	–	–	–	6	3,000	–	–	1.6
2002–2003	Caribou	95	47	45	49	80	397	–	–	118	–
2003–2004	Caribou	97	74	70	81	81	564	–	–	157	–
2004–2005	Caribou	99	62	61	81	96	546	–	–	147	–
2005–2006	Caribou	100	60	59	97	96	363	–	–	102	–
2006–2007	Caribou	97	77	74	66	69	475	–	–	143	–
2010	Caribou	94	86	76	–	–	562	65,754	707	–	–
2011	Caribou	92	70	56	49	58	437	51,129	544	134	–
2012	Caribou	99	68	62	65	79	501	58,617	598	147	–
2013	Caribou	95	79	63	62	75	586	68,534	692	166	–
2014	Bowhead	93	29	21	57	91	5	148,087	1,371	357	39.8
2014	Caribou	90	66	64	67	59	774	105,193	974	253	28.3
2014	Broad whitefish	72	60	59	52	40	11,439	36,605	339	88	9.8
2014	Arctic cisco	83	52	48	59	53	46,277	32,394	300	78	8.7

Study Year	Resource[a]	Percentage of Households Use (%)	Percentage of Households Try to Harvest (%)	Percentage of Households Harvest (%)	Percentage of Households Give (%)	Percentage of Households Receive (%)	Estimated Harvest Number[b]	Estimated Harvest Total Pounds[c]	Estimated Harvest Average Household Pounds	Estimated Harvest Per Capita Pounds	Percentage of Total Harvest (%)
2014	Bearded seal	67	38	22	40	62	13,846	13,846	128	33	3.7
2014	Least cisco	33	28	28	19	7	13,332	9,333	86	22	2.5
2014	Ringed seal	52	40	35	38	33	108	6,156	57	15	1.7
2015	Caribou	96	84	78	74	72	621	72,631	719	178	–
2016	Caribou	96	76	67	73	73	489	56,277	592	132	–
2017	Caribou	96	72	60	74	85	635	74,338	715	164	–
2018	Caribou	99	84	74	88	88	608	71,113	658	157	–
2019[f]	Caribou	100	98	91	87	78	636	74,439	658	153	–

Source: 1985 (ADF&G 2018); 1992 (Fuller and George 1999); 1993 (Pedersen 1995a); 1994–1995 (Brower and Hepa 1998); 1995–1996, 2000–2001 (Bacon, Hepa et al. 2009); 1999–2000, 2002–2007 (Braem, Kaleak et al. 2011); 2010, 2011, 2012, 2013 (SRB&A 2012, 2013, 2014, 2015); 2014 (Brown, Braem et al. 2016); 2015, 2016, 2017, 2018, 2019 (SRB&A 2017a, 2018; SRB&A 2019, 2020, 2021).

Note: "–" (No Data). For all resources study years (1985, 1992, 1993, 1994–1995, 1995–1996, 2000–2001), species are listed in descending order by percentage of the total harvest and are limited to species accounting for at least 1.0% of the total harvest; for single-resource study years, species are listed in descending order by total estimated pounds (or total number harvested, in the case of salmon study years) and limited to the five top species. Years lacking "percentage of total harvest" data were not comprehensive (i.e., all resources) study years. The estimated harvest numbers for the 1992, 1994–1995, 1995–1996, and 2000–2001 data were derived by summing individual species in each resource category. Also, for those study years, total pounds were derived from conversion rates found at ADF&G (2018) and total (usable) pounds for bowhead whales were calculated based on the method presented in SRB&A and ISER (1993). These estimates do not account for whale girth and should be considered approximate; more exact methods for estimating total whale weights are available in George, Philo et al. (n.d.). For the 2002–2003, 2003–2004, 2004–2005, 2005–2006, 2006–2007, 2010, and 2011 study years, total pounds were derived from conversion rates from (Braem, Kaleak et al. 2011).

[a] This table shows individual species unless they are not available for a given study year.

[b] Estimated numbers represent individuals in all cases except vegetation, where they represent gallons.

[c] Estimated pounds include only edible pounds and therefore do not include estimates for resources that are not typically eaten by community residents (e.g., furbearers).

[d] The estimated pounds of moose harvested in 1992 is likely too high (Fuller and George 1999).

[e] The 1994–1995 study year underrepresents the harvest of Arctic cisco and humpback whitefish (Brower and Hepa 1998); Nuiqsut did not successfully harvest a bowhead whale in 1994–1995.

[f] This study year had a low response rate due to COVID-19; thus, results and community-wide estimates should be viewed with this in mind.

1.2.1.2.1 Direct Effects Analysis Area

Nuiqsut residents harvest various resources within the direct effects analysis area, including caribou, furbearers (wolf and wolverine), seal, goose, eiders, and fish (broad whitefish and burbot). As shown in Tables E.16.2 and E.16.3, caribou are among the top species harvested, in terms of edible weight, by the community of Nuiqsut, as are broad whitefish. During most years, over half of Nuiqsut households participate in the harvests of these resources. Seals, particularly bearded seals, are another important resource that is harvested within the direct effects analysis area. Although not harvested in the same quantities as resources such as caribou and broad whitefish, seals are hunted by a substantial proportion of households (Table E.16.2). Similarly, while migratory birds generally account for less than 5% of the total annual harvest, a high percentage of households participate in harvests of these resources (between 70% and 90% across available study years; Table E.16.2). Wolf and wolverine hunting is an important, specialized activity that is practiced by a more limited subset of the community but which provides income and supports traditional crafts (e.g., providing skins and furs for sewing, craft making, and clothing).

Harvest amounts specific to the direct effects analysis area are available only for caribou. These data show the percentage of the reported caribou harvest that came from the direct effects analysis area between 2008 and 2019. These data represent only the harvests reported by a sample of active harvesters interviewed during each study year and are not based on the total estimated community harvest; thus, other harvests may have occurred within the direct effects analysis area during the study.

As shown in Table E.16.4, across 12 years of the Nuiqsut Caribou Subsistence Monitoring Project, between 14% and 36% of the annual caribou harvests have occurred within the direct effects analysis area. As noted above, residents often travel to the west of their community to hunt caribou by four-wheeler or snow machine in an area east and south of the direct effects analysis area. Caribou often travel through the analysis area before arriving in hunting areas closer to the community.

Table E.16.4. Nuiqsut Caribou Harvests Within the Direct Effects Analysis Area, 2008–2019*

Study Year	Percentage of Caribou Harvests within Direct Effects Analysis Area
Year 1 (2008)	20
Year 2 (2009)	17
Year 3 (2010)	16
Year 4 (2011)	26
Year 5 (2012)	22
Year 6 (2013)	14
Year 7 (2014)	21
Year 8 (2015)	14
Year 9 (2016)	18
Year 10 (2017)	34
Year 11 (2018)	36
Year 12 (2019)	21

Source: (SRB&A 2021)

Based on data from SRB&A (2010b), which collected subsistence use area data for key resources for the 1995–2006 time period, the direct effects analysis area is used by a majority of wolf/wolverine hunters (100% during the 1995–2006 time period), caribou hunters (94%), moose hunters (94%), goose hunters (70%), and bearded seal hunters (56%) (Table E.16.5). In addition, a substantial percentage of harvesters use the direct effects analysis area for eider hunting (50%), ringed seal hunting (43%), and broad whitefish harvest (19%). For resources as a whole, the vast majority (97%) of Nuiqsut harvesters reported using the direct effects analysis area during the study period. Based on more recent caribou harvesting data for the 2008–2019 time period, on an annual basis, between 79% and 97% of respondents use the direct effects analysis area (Table E.16.6); thus, the area is a key caribou hunting ground for the community.

Table E.16.5. Percent of Nuiqsut Harvesters Using the Direct Effects Analysis Area, 1995–2006

Resource	Total Number of Respondents for Resource	Number of Respondents in Direct Effects Analysis Area	Percentage of Nuiqsut Resource Respondents
Caribou	32	30	94%
Wolverine	24	24	100%
Wolf	23	23	100%
Goose	33	23	70%
Bearded seal	27	15	56%
Ringed seal	23	10	43%
Eiders	28	14	50%
Broad whitefish	26	5	19%
Arctic char	26	4	15%
Moose	31	29	94%
Burbot	30	1	3%
All resources	**33**	**32**	**97%**

Source: SRB&A 2010b

Table E.16.6. Percent of Nuiqsut Caribou Harvesters Using the Direct Effects Analysis Area, 2008–2019*

Study Year	Number Using Direct Effects Analysis Area	Percentage Using Direct Effects Analysis Area	Total Respondents
Year 1	35	97%	36
Year 2	51	96%	53
Year 3	51	89%	57
Year 4	56	97%	58
Year 5	52	91%	57

Study Year	Number Using Direct Effects Analysis Area	Percentage Using Direct Effects Analysis Area	Total Respondents
Year 6	46	81%	57
Year 7	56	93%	60
Year 8	49	84%	58
Year 9	50	79%	63
Year 10	60	88%	68
Year 11	43	86%	50
Year 12	20	91%	22

Source: (SRB&A 2021)

1.2.1.3 Timing of Subsistence Activities

Table E.16.7 provides data on the timing of Nuiqsut subsistence activities based on studies from the 1970s through the 2010s. Overall, Nuiqsut harvesters target the highest numbers of resources, including non-salmon fish, caribou, moose and other large land mammals, seals and bowhead whales, and plants and berries, during August and September.

Table E.16.7. Nuiqsut Annual Cycle of Subsistence Activities

Resource	Jan	Feb	Mar	Apr	May	Jun	Jul		Aug	Sep	Oct	Nov	Dec
Freshwater non-salmon	M	L	M	M	L	L	M		H	H	H	H	L
Marine non-salmon	–	–	–	–	–	–	–		–	H	H	–	–
Salmon	–	–	–	–	–	–	H		M	–	–	–	–
Caribou	L	L	M	L	L	M	H		H	M	M	L	L
Moose	L	–	–	–	–	–	L		H	H	M	L	L
Bear	M	M	M	L	L	L	L		L	H	M	M	M
Muskox	–	–	–	–	–	–	–		H	H	H	–	–
Furbearers	H	H	H	H	M	L	L		L	L	L	M	H
Small land mammals	–	–	–	–	L	L	H		H	L	–	–	–
Marine mammals	–	–	M	H	L	L	M		H	H	L	L	L
Upland birds	M	M	H	H	M	L	–		L	L	M	M	M
Waterfowl	–	–	–	L	H	H	M		M	M	M	L	L
Eggs	–	–	–	–	–	H	–		–	–	–	–	–
Plants and berries	–	–	–	–	L	L	H		H	–	–	–	–
Total number of resource categories by month	**6**	**5**	**6**	**7**	**9**	**10**	**10**		**12**	**11**	**10**	**8**	**8**

Source: 1995–1996, 2000–2001 (Bacon, Hepa et al. 2009); 2002–2007 (Braem, Kaleak et al. 2011); 1994–1995 (Brower and Hepa 1998); Pre-1979 (Brown 1979); 2014 (Brown, Braem et al. 2016); 2004 (EDAW Inc., Adams/Russel Consulting et al. 2008); 1992 (Fuller and George 1999); 2001–2012 (Galginaitis 2014); 1988 (Hoffman, Libbey et al. 1988); 1979 (Libbey, Spearman et al. 1979); 1995–2006 (SRB&A 2010b); 2008–2019 (SRB&A 2021)

Note: "–" (no documented activity and/or harvests); L (limited activity and/or harvests); M (moderate activity and/or harvests); H (high activity and/or harvests).

The month of April marks the beginning of the spring waterfowl hunting season, which peaks in May and June. Some residents also harvest goose eggs after the birds begin nesting in June. Beginning as early as May (depending on the timing of breakup), residents travel by boat along the local river system and into the Beaufort Sea to harvest various resources, including caribou, waterfowl, seals, and fish. Caribou hunting occurs throughout the year, but with the most intensity during July and August. During this time, residents also set nets for broad whitefish in local river systems or harvest fish such as Arctic grayling and Dolly Varden with rods and reels, often while hunting caribou along the Colville River. Throughout the summer months, residents also travel to the ocean to hunt for ringed seals, bearded seals, and king and common eiders, with some coastal caribou hunting occurring as well (SRB&A 2010b). Most berry and plant gathering occurs in July and August.

Beginning in August and continuing throughout September, some residents shift their focus upriver in search of moose, with caribou often a secondary pursuit during these trips. Summer rod-and-reel harvests of non-salmon fish, particularly Arctic grayling, continue into the fall as well. Preparation for the bowhead whale hunt begins in August, with whaling crews generally traveling to Cross Island in September. While at Cross Island, Nuiqsut hunters may harvest polar bears and other marine resources;

these harvesting events generally occur when whaling is not active due to weather or travel conditions. The fall Arctic cisco fishery, a major community event, may begin in September but is most productive between October and mid-November when the fish are running upriver; residents harvest them in the CRD with gillnets. Other fish, including humpback whitefish, broad whitefish, and least cisco, are caught incidentally during this time. Caribou are also harvested during October and November, as available, to the west of the community.

Starting in November and December and continuing through April, hunters pursue wolves and wolverines and target caribou and ptarmigan as needed and available. Residents may also fish for burbot through the ice during winter.

1.2.1.3.1 Direct Effects Analysis Area

Nuiqsut harvesters use the direct effects analysis area at varying levels throughout the year (Figure E.16.10). For all resources for the 1995–2006 time period, uses of the direct effects analysis area are somewhat consistent throughout the year but with a peak in summer (July and August) and again in mid- to late winter (January through March). During both the 1995–2006 and 2008–2019 time periods, caribou hunting in the direct effects analysis area peaked from July through September but continued through winter. Data from the more recent time period (2008–2019) show decreasing use of the direct effects analysis area in the winter months, consistent with the increasing use of ATVs instead of snow machines to access areas west of Nuiqsut (SRB&A 2021). Summer hunting activities in the direct effects analysis area occur in overland areas to the west of the community, along the Colville River, and, to a lesser extent, in coastal areas to the west and east of the CRD. Wolf and wolverine hunters use the direct effects analysis area solely during November through April, with goose hunting peaking in April and May and occurring to a lesser extent in June. Seal and eider hunting occur offshore primarily during the open-water months of June through September, although some eider hunting occurs as early as May. Fishing occurs in the direct effects analysis area between June and October, peaking in July and August, with minimal activity in November and December. Fishing occurs primarily along the Colville River and in Fish (Iqalliqpik) Creek.

1.2.1.4 Travel Methods

As shown in Table E.16.8, boat is the primary travel method used for subsistence pursuits of most resources, including various non-salmon fish, caribou, moose, bowhead whale, seals, and eider. Snow machine is the primary method of travel used for the late fall, winter, and early spring pursuits of Arctic cisco, burbot, wolf and wolverine, and goose; recent data shows that while boats remain the primary method of travel to caribou use areas, ATVs and trucks have become much more common in recent years, while snow machines have become less common (SRB&A 2021).

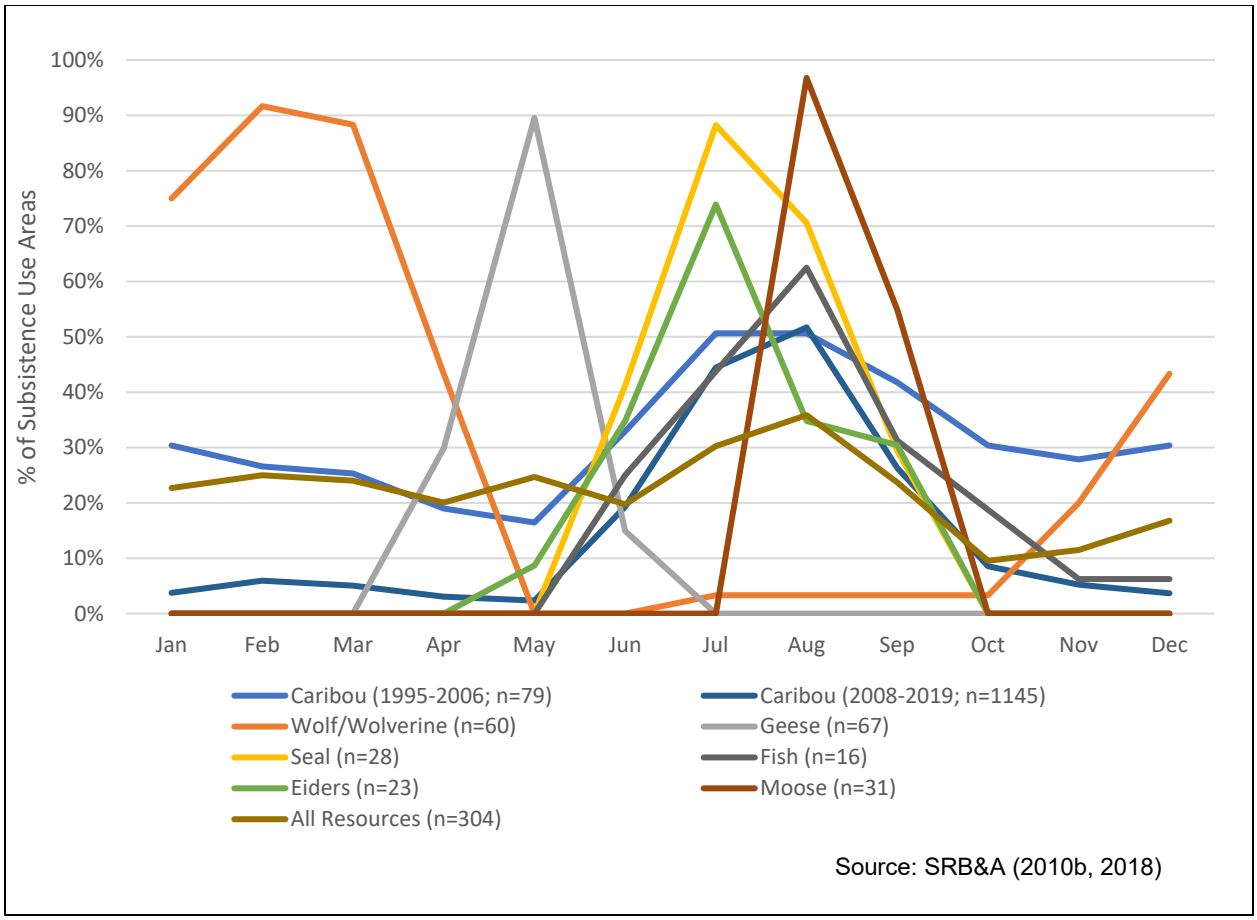


Figure E.16.10. Nuiqsut Subsistence Use Areas by Month in the Direct Effects Analysis Area, by Resource

Table E.16.8. Nuiqsut Travel Method to Subsistence Use Areas

Resource	Boat	Snow Machine	Foot	Car/Truck	ATV	Plane
Arctic cisco and burbot	L	H	L	M	–	–
Arctic char/Dolly Varden and broad whitefish	H	M	M	–	–	–
Caribou	H	M	–	L	M	–
Moose	H	–	M	–	–	–
Wolf and wolverine	M	H	–	–	–	M
Bowhead whale	H	–	–	–	–	–
Seals	H	M	–	–	–	–
Goose	M	H	M	L	L	–
Eider	H	M	–	–	–	–
Total number of resources targeted	**9**	**7**	**4**	**3**	**2**	**1**

Source: 1995–2006 (SRB&A 2010b); 2008–2019 (SRB&A 2021)
Note: "–" (no documented use of travel method); ATV (all-terrain vehicle); L (limited use of travel method); M (moderate use of travel method); H (high use of travel method). Caribou based on SRB&A (2017a; 2021). All others based on SRB&A (2010a).

1.2.1.4.1 Direct Effects Analysis Area

Because the direct effects analysis area includes terrestrial, riverine, and marine areas, travel methods used by Nuiqsut harvesters vary by location. As shown in Figure E.16.11, for the 1995–2006 time period, snow machine was the primary method used to access the direct effects analysis area, followed closely by boat. No other travel methods were used (except minimally) within the direct effects analysis area. During

the 2008–2019 time period, Nuiqsut caribou hunters primarily accessed the direct effects analysis area by boat (65% of use areas). A smaller percentage of use areas were accessed during that time period by snow machine (17%) or ATV (four-wheeler) (16%). Figure E.16.11 shows an increase in the use of ATVs in the direct effects analysis area during the 2008–2019 time period. Recent data from the Nuiqsut Caribou Subsistence Monitoring Project also show the increased use of trucks to access caribou hunting areas west of the community due to the construction of easily accessible gravel roads (SRB&A 2021).

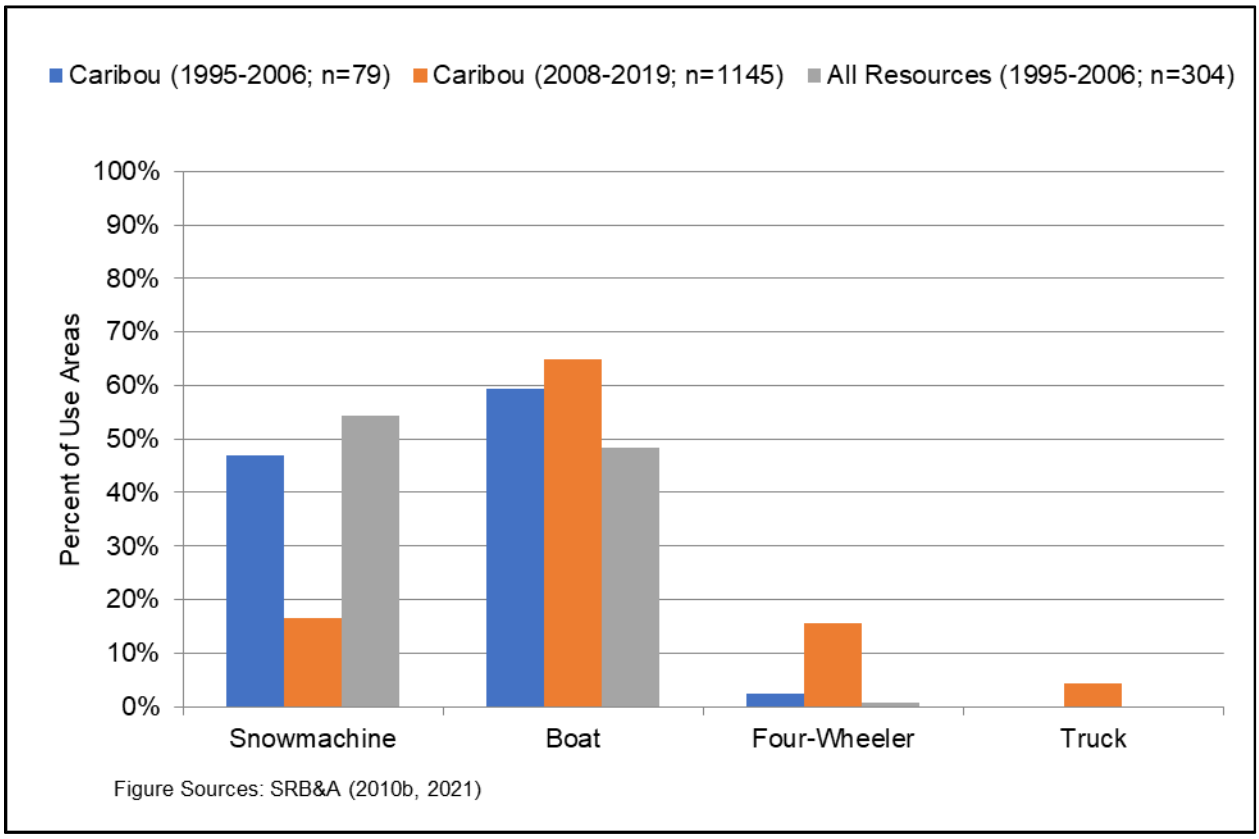


Figure E.16.11. Nuiqsut Travel Methods in the Direct Effects Analysis Area

1.2.1.5 Resource Importance

An analysis of resource importance based on harvest (average percentage of total harvest), harvest effort (average percentage of households attempting to harvest), and sharing (average percentage of households receiving) variables is provided in Table E.16.9. Based on this analysis, resources of major importance in Nuiqsut are Arctic cisco, Arctic grayling, bearded seal, bowhead whale, broad whitefish, burbot, caribou, cloudberry, white-fronted goose, and wood (driftwood).

Table E.16.9. Relative Importance of Subsistence Resources Based on Selected Variables, Nuiqsut

Resource Category	Resource[a]	Percentage of Households Trying to Harvest	Percentage of Households Receiving	Percentage of Total Harvest
Major resources[b]	Arctic cisco	61	57	8.8
Major resources[b]	Arctic grayling	50	24	1.0
Major resources[b]	Bearded seal	32	50	1.6
Major resources[b]	Bowhead whale[c]	30	96	30.4
Major resources[b]	Broad whitefish	69	49	15.5
Major resources[b]	Burbot	51	35	1.0
Major resources[b]	Caribou	75	77	29.9
Major resources[b]	Cloudberry	55	29	0.0
Major resources[b]	White-fronted goose	62	36	1.4
Major resources[b]	Wood[d]	50	3.2	0.0

Resource Category	Resource[a]	Percentage of Households Trying to Harvest	Percentage of Households Receiving	Percentage of Total Harvest
Moderate resources[e]	Arctic char	38	22	0.9
Moderate resources[e]	Arctic fox	14	1	0.0
Moderate resources[e]	Beluga	2	24	0.0
Moderate resources[e]	Bird eggs	16	12	0.0
Moderate resources[e]	Blueberries	29	16	0.0
Moderate resources[e]	Brant	17	9	0.1
Moderate resources[e]	Brown bear	14	18	0.2
Moderate resources[e]	Canada goose	42	24	0.4
Moderate resources[e]	Chum salmon	23	11	0.6
Moderate resources[e]	Ground squirrel	45	8	0.1
Moderate resources[e]	Humpback whitefish	26	9	1.0
Moderate resources[e]	King eider	24	19	0.0
Moderate resources[e]	Least cisco	40	17	1.1
Moderate resources[e]	Long-tailed duck	8	13	0.0
Moderate resources[e]	Moose	40	41	2.5
Moderate resources[e]	Pink salmon	28	17	0.4
Moderate resources[e]	Polar bear	7	29	0.2
Moderate resources[e]	Ptarmigan	48	15	0.2
Moderate resources[e]	Rainbow smelt	13	22	0.1
Moderate resources[e]	Red fox	22	2	0.0
Moderate resources[e]	Ringed seal	36	43	1.6
Moderate resources[e]	Snow goose	19	7	0.0
Moderate resources[e]	Spotted seal	13	5	0.1
Moderate resources[e]	Walrus	7	43	0.2
Moderate resources[e]	Wolf	18	6	0.0
Moderate resources[e]	Wolverine	22	5	0.0
Minor resources[f]	Arctic cod	7	7	0.0
Minor resources[f]	Chinook salmon	2	9	0.0
Minor resources[f]	Coho salmon	3	5	0.0
Minor resources[f]	Common eider duck	7	3	0.1
Minor resources[f]	Cranberries	9	5	0.0
Minor resources[f]	Crowberries	7	2	0.0
Minor resources[f]	Dall sheep	–	9	0.0
Minor resources[f]	Dolly Varden	10	3	0.4
Minor resources[f]	Lake trout	3	8	0.0
Minor resources[f]	Muskox	–	8	0.3
Minor resources[f]	Northern pike	7	7	0.0
Minor resources[f]	Northern pintail	5	1.6	0.0
Minor resources[f]	Round whitefish	5	1	0.1
Minor resources[f]	Saffron cod	7	–	0.0
Minor resources[f]	Sheefish	–	6	0.0
Minor resources[f]	Sockeye salmon	3	6	0.0
Minor resources[f]	Sourdock	5	7	0.0
Minor resources[f]	Weasel	5	–	0.0

Source: 1985 (ADF&G 2018); 1992 (Fuller and George 1999); 1993 (Pedersen 1995b); 1994–1995 (Brower and Hepa 1998); 1995–1996, 2000–2001 (Bacon, Hepa et al. 2009); 1999–2000, 2002–2007 (Braem, Kaleak et al. 2011); 2010–2013, 2015-2019 (SRB&A 2021); 2014 (Brown, Braem et al. 2016)

Note: "–" (No Data).

[a] For space considerations, resources that contributed an average of less than 1% of the harvest, less than 5% attempting to harvest, and less than 5% of receiving resources are categorized as minor and are not shown.

[b] Major resources contribute > 9% of the total harvest, have ≥ 50% of households attempting to harvest, or have ≥ 50% of households receiving resources.

[c] Averages include unsuccessful bowhead whale harvest years.

[d] The inclusion of wood is based on a single study year (1993); data on wood were not collected during any other study year.

[e] Moderate resources contribute 2% to 9% of the total harvest, have 11% to 49% of households attempting to harvest, or have 11% to 49% of households receiving resources.

[f] Minor resources contribute < 2% of the total harvest, have ≤ 10% of households attempting to harvest, or have ≤ 10% of households receiving resource.

1.2.2 Utqiaġvik

Utqiaġvik (Barrow) is the North Slope's most populous community and is located on the northern coast of the Chukchi Sea. The town site is approximately 7.5 miles south of Point Barrow, the demarcation point between the Chukchi and Beaufort seas. In 2016, the residents of Barrow voted to formally rename the town to its original Iñupiaq name of Utqiaġvik. The community is also traditionally known as Ukpeagvik, which means "place where snowy owls are hunted" (NSB 2018). Continuous occupation of the Utqiaġvik area began approximately 1,300 years ago. Following European contact in the early 1800s, the growth of the commercial whaling and trapping industries brought Iñupiat from across the North Slope to Utqiaġvik in pursuit of employment and trade opportunities. The Naval Petroleum Reserve 4 was established in 1923, and in the late 1940s, the U.S. Navy established a base camp in Utqiaġvik from which to launch oil exploration in the reserve (Jensen 2009). The established mission of the naval base camp shifted away from oil exploration in the 1950s, and the base became the Naval Arctic Research Laboratory. Throughout the late 1900s, Utqiaġvik continued to grow as new economic opportunities, including oil and gas exploration, arose on the North Slope. Today, Utqiaġvik is the headquarters for various regional organizations and corporations, including the NSB and the Arctic Slope Regional Corporation (NSB 2016). In 2020, the population of Utqiaġvik was estimated at 4,927 residents living in 1,334 occupied households; 63.4% were Alaska Native (USCB 2021). The community remains primarily Iñupiat, and subsistence remains an important part of the community's identity and social fabric.

1.2.2.1 Subsistence Use Areas

Figure E.16.12 depicts Utqiaġvik subsistence use areas for all resources for various historic and contemporary time periods (BLM 2004; Brown, Braem et al. 2016; Pedersen 1979; SRB&A 2010b, Unpublished; SRB&A and ISER 1993). Time periods range from lifetime use areas documented in 1979 (Pedersen 1979) to single-year use areas documented in 2014 (Brown, Braem et al. 2016). Lifetime (pre-1979) use areas include locations as far south as the Colville River near Umiat, beyond Nuiqsut in the east, offshore from the community to the southeast and southwest, and inland beyond Wainwright toward Point Lay. Harvest sites and use areas for the 1987–1989 time period are similar to those recorded for the pre-1979 time period but extend farther offshore from the community. The harvest sites for the 1987–1989 time period are concentrated in offshore areas between Peard Bay and Smith Bay and onshore areas extending south from the community beyond the Colville River and into the foothills of the Brooks Range. More recent use areas studies for the 1994–2003 and 1997–2006 time periods show somewhat larger use area extents, with use areas extending well offshore to the north of the community, east toward the Kuparuk River area, south to the Colville River, and as far west as Point Lay. Overlapping subsistence use areas for the 1997–2006 time period show the greatest concentration of use areas occurring offshore from the community up to 20 miles and in an overland area south of the community and along the Chipp and Ikpikpuk rivers. Use areas for the 2014 time period are consistent with these areas of highest overlapping use. In addition, some isolated use areas were reported for the 2014 time period offshore from Icy Cape and near Point Lay.

Resource-specific use area maps for Utqiaġvik are shown in Figures E.16.13 through E.16.20 for the time periods mentioned above. Utqiaġvik subsistence use areas for large land mammals are shown in Figures E.16.13 through E.16.15. Caribou use areas (Figure E.16.13) cover an extensive area from Icy Cape to Prudhoe Bay and as far south as the Colville River. Caribou use areas for the 1997–2006 time period extend farther south and east than previous time periods; the highest number of overlapping caribou use areas extend in an overland area approximately 30 miles south of the community and along local river systems. Caribou use areas for the most recent time period (2014) are generally within those documented for the 1997–2006 time period. Figure E.16.14 depicts Utqiaġvik moose use areas, and for most time periods, shows use concentrated along the Colville River, where moose are more likely to be found. Use areas from the 1997–2006 and 2014 time periods indicate a considerably larger area extending between Utqiaġvik and the Colville River. Utqiaġvik use areas for other large land mammals (e.g., grizzly/brown bear, Dall sheep, and polar bear) are shown on Figure E.16.15. Polar bear use areas occur in the Chukchi Sea at distances of no more than 20 miles from shore, while grizzly bear use areas are concentrated in

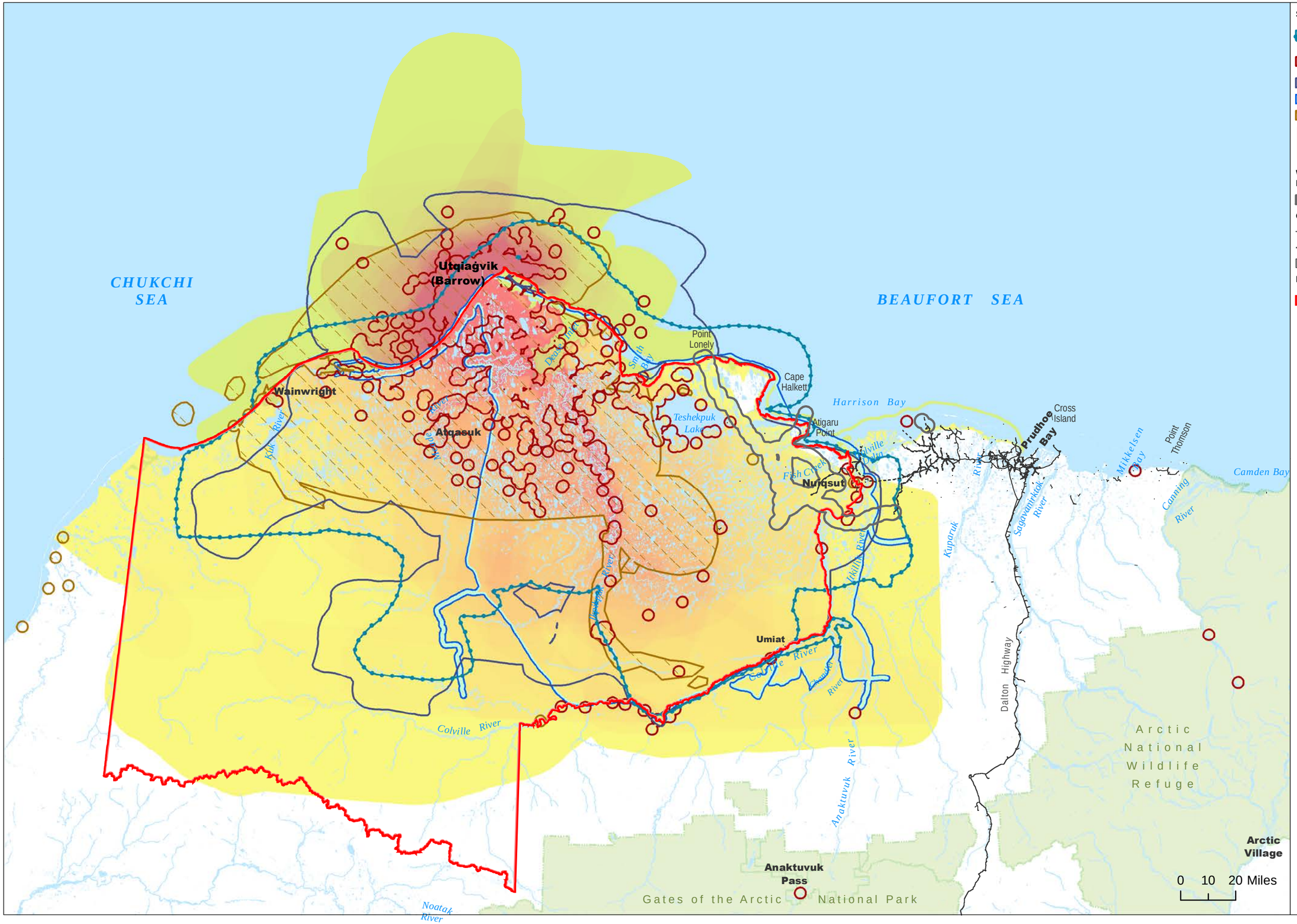
various inland areas bounded by Wainwright and the Kuk River in the west and the Ikpikpuk River in the east.

Utqiaġvik small land mammal use areas (Figure E.16.16) cover an extensive area from Point Lay to the Kuparuk River and beyond the Colville River in the south. The extent of furbearer and small land mammal use areas has expanded over time. Lifetime furbearer and small land mammal use areas cover areas from Wainwright in the west to Nuiqsut in the east, and as far south as the Colville River, while 1997–2006 use areas for wolf and wolverine extend beyond Icy Cape to Point Lay in the west, past Nuiqsut to the Kuparuk River in the east, and well beyond the Colville River in the south. High numbers of overlapping use areas occur south and east of the community toward the Colville River. Small land mammal use areas for the most recent time period (2014) occurred primarily along the Ikpikpuk River toward the Colville River.

Utqiaġvik fishing areas for all available time periods are depicted in Figure E.16.17 and show residents fishing across a large river and lake system to the south of the community, west to the Kuk River near Wainwright, and as far east as Teshekpuk Lake and the Colville River. Most time periods also show fish harvesting in coastal waters and lagoon systems in the Chukchi and Beaufort seas. More recent use areas from the 1994–2003, 1997–2006, and 2014 time periods occur along river and lake systems to the south and east of the community as far as the Teshekpuk Lake and upper Judy Creek areas.

Utqiaġvik use areas for birds (Figure E.16.18), including eiders and goose, are relatively consistent over time, although they extend considerably farther offshore during the 1997–2006 time period (SRB&A 2010b). Use areas are located offshore at a distance greater than 40 miles from the community, inland beyond Atqasuk in the west, and east as far as Nuiqsut. Bird use areas from more recent time periods (1994–2003, 1997–2006, and 2014) are concentrated along the Meade, Chipp, and Ikpikpuk rivers. Utqiaġvik harvests of vegetation (including berries and plants) and wood are depicted in Figure E.16.19 for various time periods. Vegetation and wood harvests generally occur to the south and southeast of the community, in addition to coastal areas (primarily for driftwood). More recent use areas for the 2014 time period occur over a large area that extends southwest to Wainwright and southeast to the Ikpikpuk River. Several isolated berry and plant harvesting areas have also been reported as far as Point Lay and Colville River.

Utqiaġvik subsistence use areas for marine mammals are shown on Figure E.16.20 and occur at varying offshore distances in the Beaufort and Chukchi seas. The offshore extent of marine mammal use areas has grown over time. SRB&A's (2010b) 1997–2006 marine mammals use areas show Utqiaġvik residents traveling beyond Wainwright in the west and offshore more than 80 miles, with the highest numbers of overlapping use areas occurring between 10 and 25 miles from shore. During the 2014 time period, marine mammal use areas occurred between Icy Cape and Dease Inlet and up to approximately 40 miles from shore.



Subsistence Data

- All Resources, Lifetime Previous to 1979 [a]
- All Resource Harvest Sites Buffered, 1987-1989 [b]
- All Resources, 1987-1989 [c]
- All Resources, 1994-2003 [d]
- All Resources, 2014 [e]
- High / Low — Overlapping Subsistence Use Areas All Resources, 1997-2006 [f]

Willow Proposed Development Features

- Direct Effects Area

Other Infrastructure

- Existing Road
- Existing Pipeline
- Existing Infrastructure

Land Designation

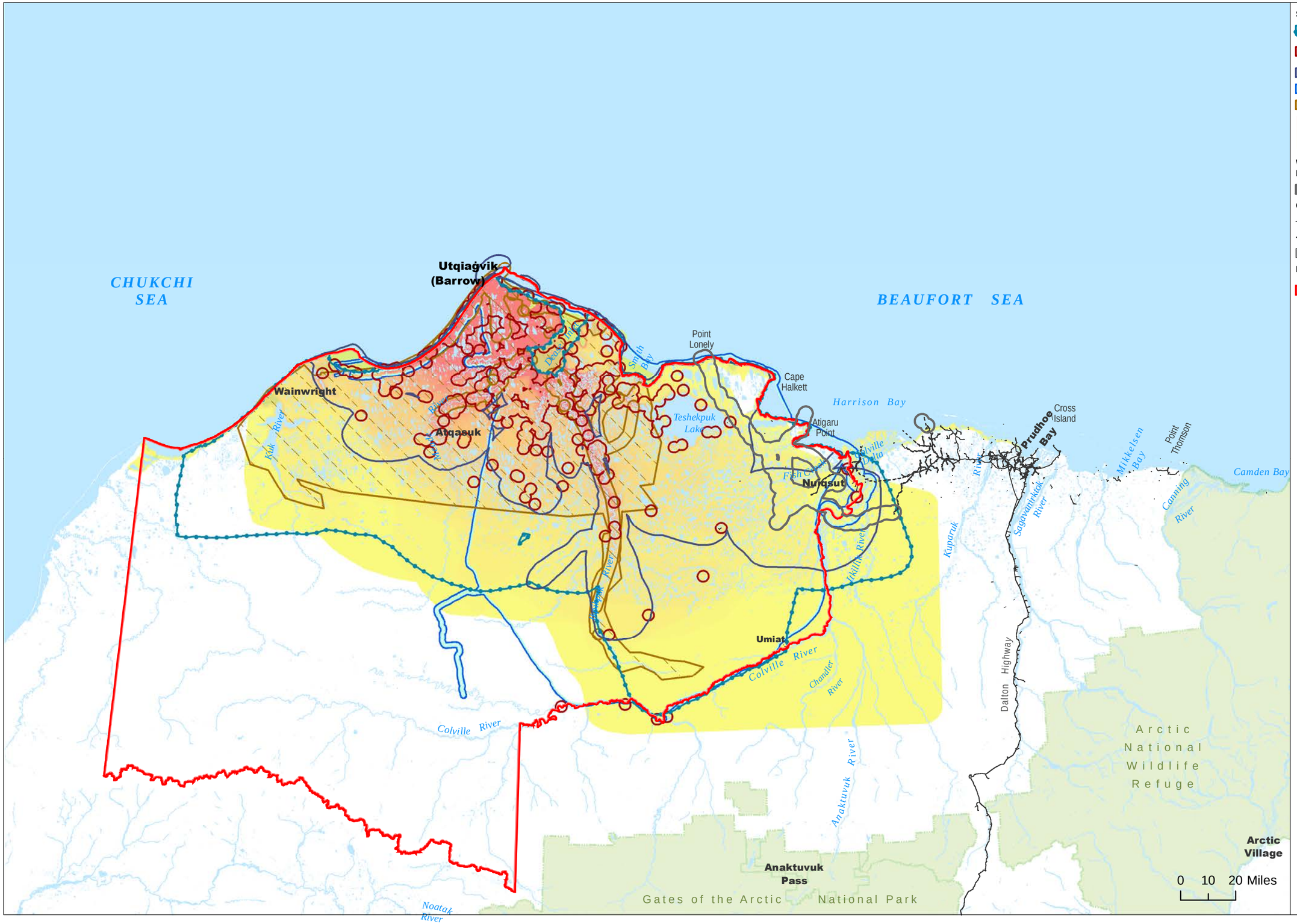
- National Petroleum Reserve in Alaska

Map prepared by
Stephen R. Braund & Associates

Source
a. Pedersen 1979
b. SRB&A and ISER 1993
c. SRB&A Unpublished
d. BLM 2004
e. Brown et al. 2016
f. SRB&A 2010a

No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual or aggregate use with other data. Original data were compiled from various sources. This information may not meet National Map Accuracy Standards. This product was developed through digital means and may be updated without notification.

Figure E.16.12



Subsistence Data

- Caribou, Lifetime Prior to 1979 [a]
- Caribou Harvest Sites Buffered, 1987-1989 [b]
- Caribou, 1987-1989 [c]
- Caribou, 1994-2003 [d]
- Caribou, 2014 [e]
- Overlapping Subsistence Use Areas Caribou, 1997-2006 [f] (High / Low)

Willow Proposed Development Features

- Direct Effects Area

Other Infrastructure

- Existing Road
- Existing Pipeline
- Existing Infrastructure

Land Designation

- National Petroleum Reserve in Alaska

Map prepared by
Stephen R. Braund & Associates

Source
a. Pedersen 1979
b. SRB&A and ISER 1993
c. SRB&A Unpublished
d. BLM 2004
e. Brown et al. 2016
f. SRB&A 2010a

Figure E.16.13

CHUKCHI SEA

BEAUFORT SEA

Utqiaġvik (Barrow)

Wainwright

Atqasuk

Nuiqsut

Umiat

Arctic Village

Anaktuvuk Pass

Point Lonely

Cape Halkett

Harrison Bay

Atigaru Point

Teshekpuk Lake

Dease Inlet

Smith Bay

Meade River

Kuk River

Ikpikpuk River

Fish Creek

Colville Delta

Ikkillik River

Kuparuk River

Prudhoe Bay

Cross Island

Mikkelsen Bay

Point Thomson

Camden Bay

Canning River

Sagavanirktok River

Dalton Highway

Colville River

Chandler River

Anaktuvuk River

Noatak River

Arctic National Wildlife Refuge

Gates of the Arctic National Park

0 10 20 Miles

Subsistence Data

- Moose, Lifetime Previous to 1979 [a]
- Moose Harvest Sites Buffered, 1987-1989 [b]
- Moose, 1987-1989 [c]
- Moose, 1994-2003 [d]
- Moose, 2014 [e]
- High / Low: Overlapping Subsistence Use Areas Moose, 1997-2006 [f]

Willow Proposed Development Features

- Direct Effects Area

Other Infrastructure

- Existing Road
- Existing Pipeline
- Existing Infrastructure

Land Designation

- National Petroleum Reserve in Alaska

Map prepared by
Stephen R. Braund & Associates

Source
a. Pedersen 1979
b. SRB&A and ISER 1993
c. SRB&A Unpublished
d. BLM 2004
e. Brown et al. 2016
f. SRB&A 2010a

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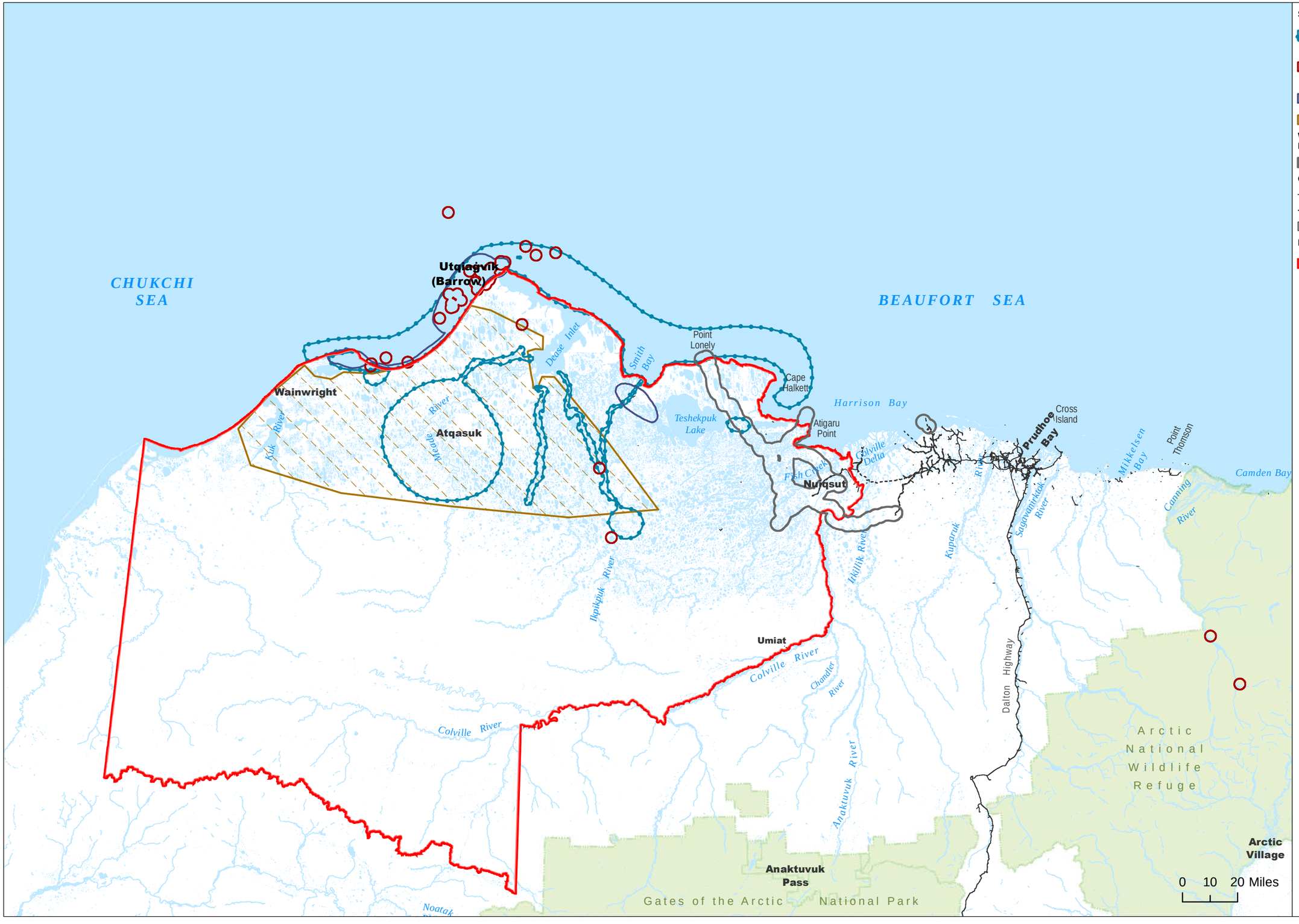
Figure E.16.14



Subsistence Data

- Grizzly Bear and Polar Bear, Lifetime Previous to 1979 [a]
- Brown Bear, Dall Sheep and Polar Bear Harvest Sites Buffered, 1987-1989 [b]
- Brown Bear and Polar Bear, 1987-1989 [c]
- Brown Bear, 2014 [d]

Willow Proposed Development Features

- Direct Effects Area

Other Infrastructure

- Existing Road
- Existing Pipeline
- Existing Infrastructure

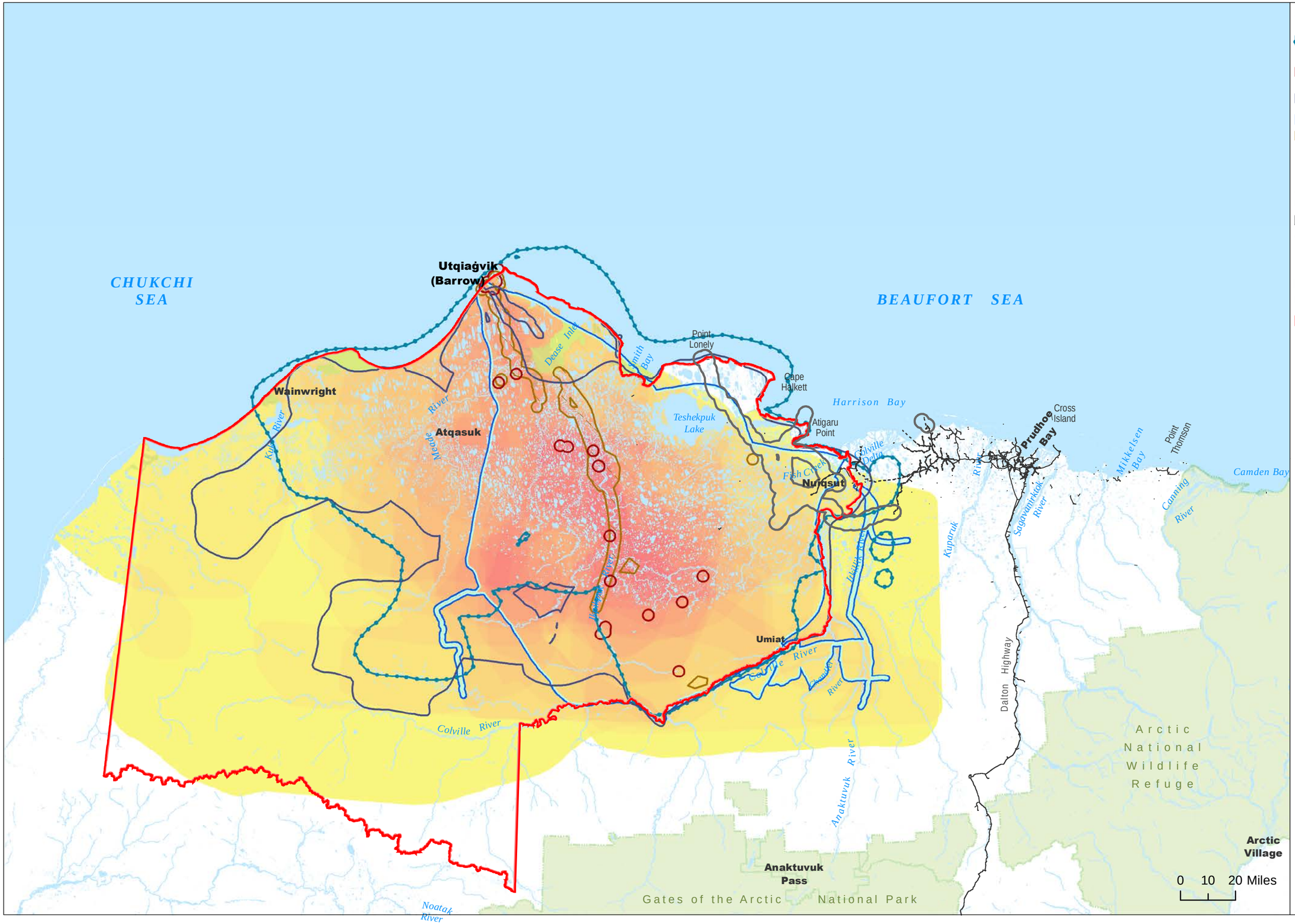
Land Designation

- National Petroleum Reserve in Alaska

Map prepared by
Stephen R. Braund & Associates

Source
a. Pedersen 1979
b. SRB&A and ISER 1993
c. SRB&A Unpublished
d. Brown et al. 2016

Figure E.16.15



Subsistence Data

- Furbearers, Small Land Mammals and Trapping, Lifetime Previous to 1979 [a]
- Furbearer and Small Land Mammal Harvest Sites Buffered, 1987-1989 [b]
- Furbearer and Small Land Mammals, 1987-1989 [c]
- Wolf and Wolverine, 1994-2003 [d]
- Small Land Mammals, 2014 [e]
- Overlapping Subsistence Use Areas Wolf and Wolverine 1997-2006 [f] (High / Low)

Willow Proposed Development Features

- Direct Effects Area

Other Infrastructure

- Existing Road
- Existing Pipeline
- Existing Infrastructure

Land Designation

- National Petroleum Reserve in Alaska

Map prepared by
Stephen R. Braund & Associates

Source
a. Pedersen 1979
b. SRB&A and ISER 1993
c. SRB&A Unpublished
d. BLM 2004
e. Brown et al. 2016
f. SRB&A 2010a

No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual or aggregate use with other data. Original data were compiled from various sources. This information may not meet National Map Accuracy Standards. This product was developed through digital means and may be updated without notification.

Figure E.16.16

CHUKCHI SEA

BEAUFORT SEA

Utqiaġvik (Barrow)

Wainwright

Atqasuk

Point Lonely

Cape Halkett

Harrison Bay

Atigaru Point

Teshekpuk Lake

Cross Island

Prudhoe Bay

Nuiqsut

Colville Delta

Fish Creek

Mikkelsen Bay

Point Thomson

Camden Bay

Canning River

Sagavanirktok River

Kuparuk River

Itkillik River

Ipnikpuk River

Umiat

Colville River

Chandler River

Dalton Highway

Arctic National Wildlife Refuge

Arctic Village

Anaktuvuk Pass

Gates of the Arctic National Park

Noatak River

Kuk River

Meade River

Smith Bay

Dease Inlet

0 10 20 Miles

Subsistence Data

- Fishing, Lifetime Previous to 1979 [a]
- Fish, 1979-1983 [b]
- Fish Harvest Sites Buffered, 1987-1989 [c]
- All Fish, 1987-1989 [d]
- Fish, 1994-2003 [e]
- Fish, 1997-2006 [f]
- Non-Salmon and Salmon, 2014 [g]

Willow Proposed Development Features

- Direct Effects Area

Other Infrastructure

- Existing Road
- Existing Pipeline
- Existing Infrastructure

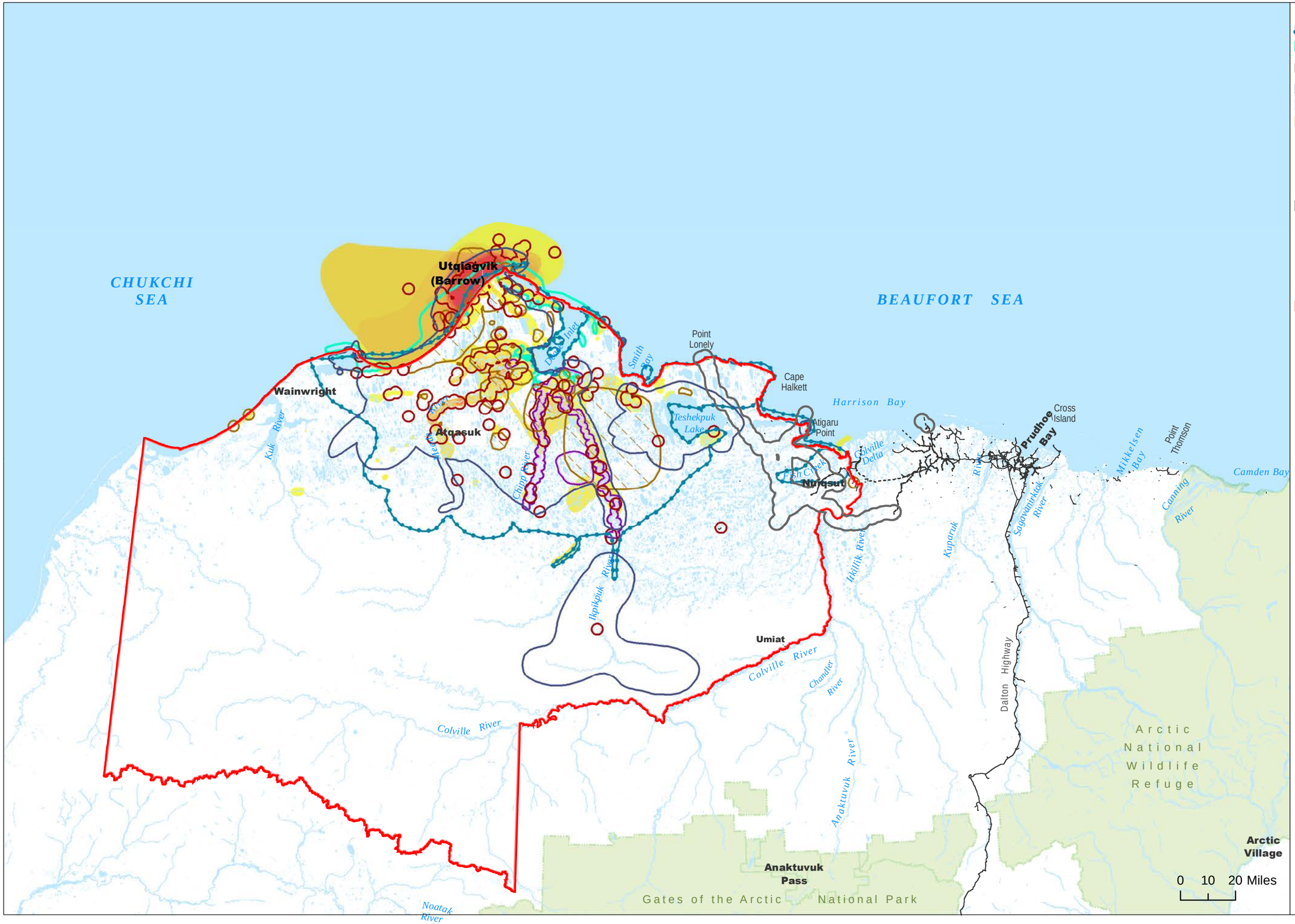
Land Designation

- National Petroleum Reserve in Alaska

Map prepared by
Stephen R. Braund & Associates

Source
a. Pedersen 1979
b. Alaska Consultants, Inc. 1984
c. SRB&A and ISER 1993
d. SRB&A Unpublished
e. BLM 2004
f. SRB&A 2010a
g. Brown et al. 2016

Figure E.16.17



Subsistence Data

- Wildfowl, Lifetime Previous to 1979 [a]
- Birds, 1979-1983 [b]
- Bird Harvest Sites Buffered, 1987-1989 [c]
- Birds, 1987-1989 [d]
- Geese, 1994-2003 [e]
- Birds, 2014 [f]
- Overlapping Subsistence Use Areas Eider and Geese, 1997-2006 [g] (High / Low)

Willow Proposed Development Features

- Direct Effects Area

Other Infrastructure

- Existing Road
- Existing Pipeline
- Existing Infrastructure

Land Designation

- National Petroleum Reserve in Alaska

Map prepared by
Stephen R. Braund & Associates

Source
a. Pedersen 1979
b. Alaska Consultants, Inc. 1984
c. SRB&A and ISER 1993
d. SRB&A Unpublished
e. BLM 2004
f. Brown et al. 2016
g. SRB&A 2010a

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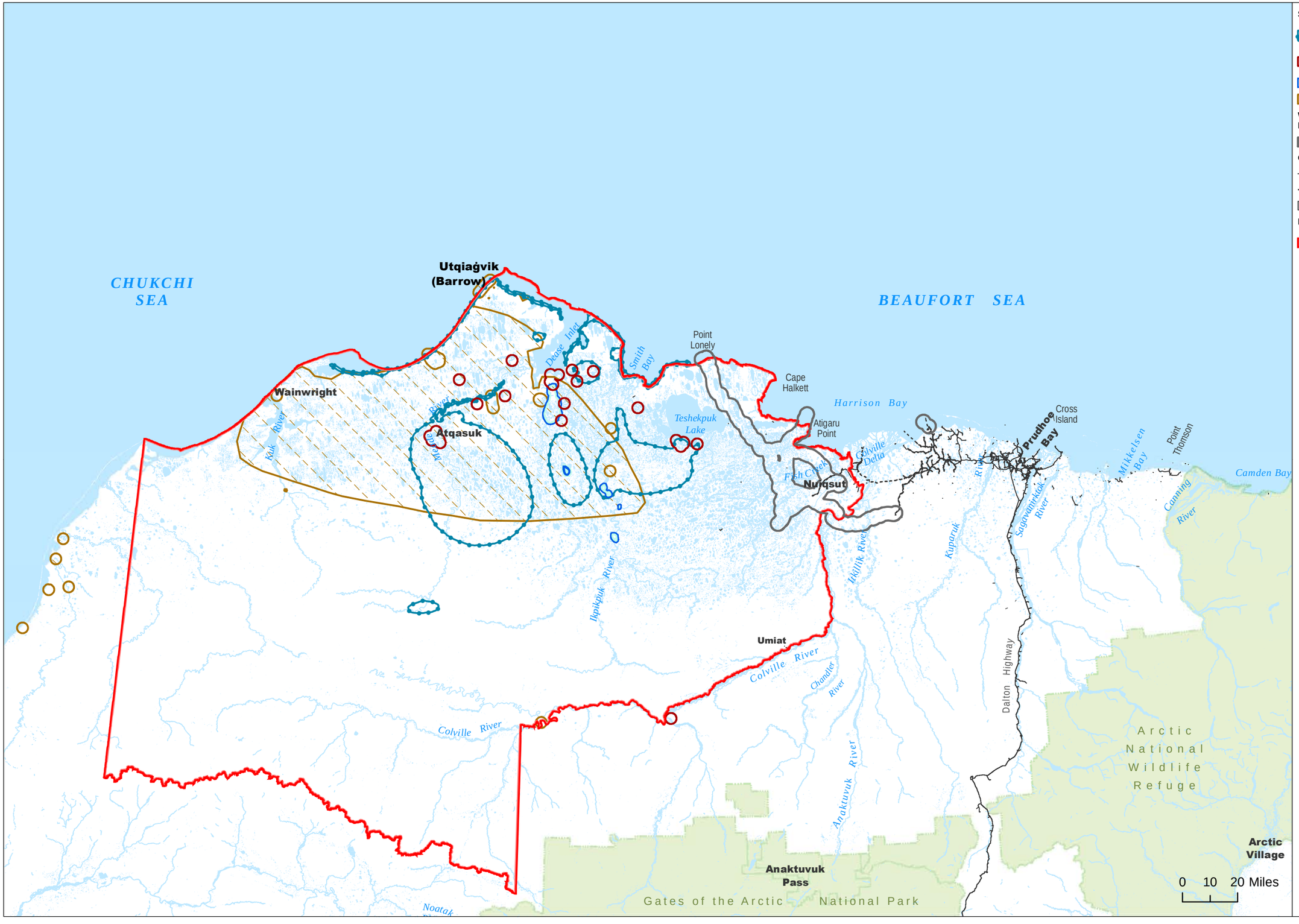
Figure E.16.18



Subsistence Data

- Vegetation and Wood, Lifetime Previous to 1979 [a]
- Berry and Plant Harvest Sites Buffered, 1987-1989 [b]
- Berries, 1994-2003 [c]
- Berries and Plants, 2014 [d]

Willow Proposed Development Features

- Direct Effects Area

Other Infrastructure

- Existing Road
- Existing Pipeline
- Existing Infrastructure

Land Designation

- National Petroleum Reserve in Alaska

Map prepared by
Stephen R. Braund & Associates

Source
a. Pedersen 1979
b. SRB&A and ISER 1993
c. BLM 2004
d. Brown et al. 2016

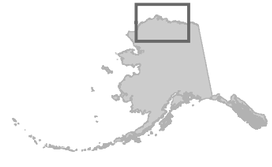
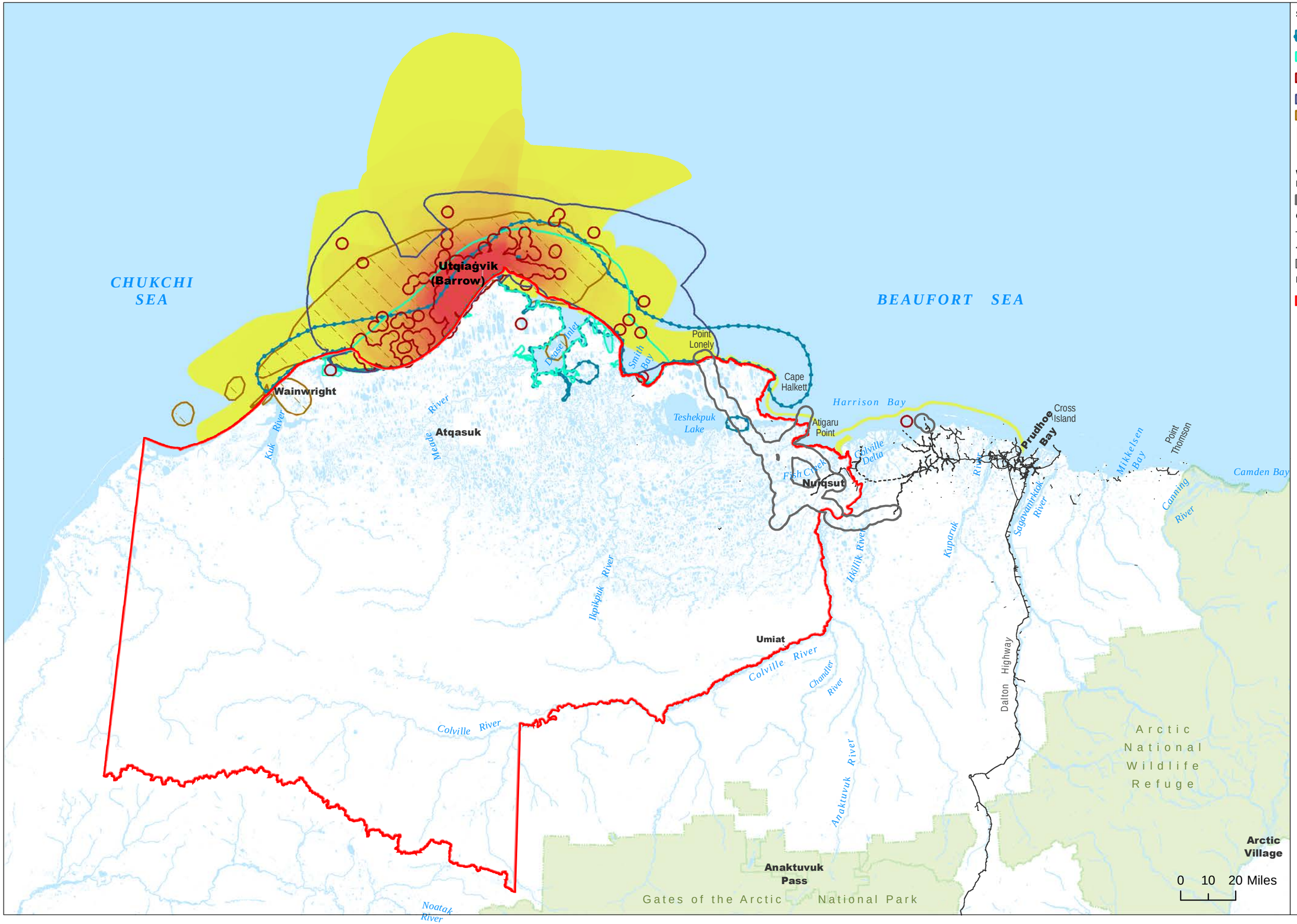


Figure E.16.19



Subsistence Data

- Marine Mammals, Lifetime Previous to 1979 [a]
- Marine Mammals, 1979-1983 [b]
- Marine Mammal Harvest Sites Buffered, 1987-1989 [c]
- Marine Mammals, 1987-1989 [d]
- Marine Mammals, 2014 [e]
- Overlapping Subsistence Use Areas Marine Mammals, 1997-2006 [f] (High / Low)

Willow Proposed Development Features

- Direct Effects Area

Other Infrastructure

- Existing Road
- Existing Pipeline
- Existing Infrastructure

Land Designation

- National Petroleum Reserve in Alaska

Map prepared by
Stephen R. Braund & Associates

Source
a. Pedersen 1979
b. Alaska Consultants, Inc. 1984
c. SRB&A and ISER 1993
d. SRB&A Unpublished
e. Brown et al. 2016
f. SRB&A 2010a

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Figure E.16.20

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1.2.2.1.1 Direct Effects Analysis Area

Subsistence use of the direct effects analysis area, defined as the area within 2.5 miles of Project infrastructure, is limited among Utqiaġvik harvesters. For the 1995–2006 time period, use areas overlapping the direct effects analysis area accounted for only 3% of all use areas documented for Utqiaġvik harvesters (Table E.16.10).

Table E.16.10. Utqiaġvik Use Areas within the Direct Effects Analysis Area

Source	Resource Type	Time Period	Total Number of Use Areas	Number (%) of Use Areas in Direct Effects Analysis Area
SRB&A 2010b	All resources	1995–2006	2,029	50 (3%)

In general, the direct effects analysis area is located in the northeastern periphery of Utqiaġvik's extensive subsistence use areas. Resource uses that overlap include caribou, moose, other large land mammals, furbearers and small land mammals, fish, birds, and marine mammals (Figures E.16.12 through E.16.20). Resources that overlap during a majority of study years include caribou, moose, and furbearers and small land mammals. While most resource uses overlap a smaller portion of the direct effects analysis area or overlap areas of low overlapping use, the direct effects analysis area is directly to the east of Teshekpuk Lake, which is an area of high subsistence activity for caribou, furbearers and small land mammals, and fish. In addition, the direct effects analysis area overlaps the Colville River upriver from the community of Nuiqsut, an area used by some Utqiaġvik harvesters for moose hunting during fall.

1.2.2.2 Harvest and Use Data

Tables E.16.11 through E.16.13 provide subsistence harvest data for Utqiaġvik. Intermittent subsistence harvest studies exist for Utqiaġvik harvests from 1987 through 2014, consisting of 10 comprehensive (i.e., all resources) studies (Tables E.16.11 and E.16.13) (Bacon, Hepa et al. 2009; Brown, Braem et al. 2016; Fuller and George 1999; SRB&A and ISER 1993) and four single-resource studies (Table E.16.12) (Naves and Braem 2014). Studies show Utqiaġvik households harvesting between 204 and 362 per capita pounds of subsistence resources during available study years. Marine mammals have contributed the highest amount toward the total subsistence harvests in Utqiaġvik (at least 50% of pounds of usable weight), followed by large land mammals (between 20% and 40% of pounds of usable weight). Non-salmon fish and migratory birds provided a smaller, but substantial, portion of the yearly harvest during most years. While bird harvests appear modest in terms of pounds, residents of Utqiaġvik harvest large numbers of both migratory and upland game birds. In 2014, Utqiaġvik residents harvested an estimated 19,049 migratory birds and 911 upland game birds. The single-resource bird harvest study from the mid-to-late 2000s shows varying levels of bird and egg harvests by Utqiaġvik residents from year to year (Table E.16.12).

In terms of species, bowhead whales have been the most harvested resource during all but 2 study years (1987 and 2014), providing between 28.4% and 64.4% of the subsistence harvest (Table E.16.13). Caribou was the second-most harvested resource during all but 2 study years, accounting for between 16.4% and 31.8% of Utqiaġvik harvests. Other species that have contributed highly to Utqiaġvik subsistence harvests over the study years include seal (bearded and ringed), walrus, whitefish (especially broad whitefish), white-fronted goose, eiders, polar bear, Arctic grayling, and moose. The most recent comprehensive study year (2014) also showed beluga and salmon (chum and sockeye) among the top 10 species harvested. Although only accounting for a small portion of Utqiaġvik's yearly harvest, vegetation (e.g., berries and plants), marine invertebrates (e.g., clams), and eggs are also harvested annually by Utqiaġvik residents.

Table E.16.11. Utqiaġvik Subsistence Harvest Estimates by Resource Category, All Resources Study Years

Study Year	Resource	Percentage of Households Use	Percentage of Households Try to Harvest	Percentage of Households Harvest	Percentage of Households Give	Percentage of Households Receive	Estimated Harvest Number[a]	Estimated Harvest Total Pounds[b]	Estimated Harvest Average Household Pounds	Estimated Harvest Per Capita Pounds	Percentage of Total Harvest
1987	All resources	–	–	58	–	–	–	621,067	663	206	100.0
1987	Salmon	–	–	3	–	–	196	1,190	1	<1	0.2
1987	Non-salmon fish	–	–	–	–	–	45,367	67,262	72	22	10.8
1987	Large land mammals	–	–	–	–	–	1,660	213,777	228	71	34.4
1987	Small land mammals	–	–	–	–	–	233	58	<1	<1	<0.1
1987	Marine mammals	–	–	41	–	–	–	316,229	337	105	50.9
1987	Migratory birds	–	–	–	–	–	8,125	20,618	22	7	3.3
1987	Upland game birds	–	–	16	–	–	2,454	1,717	2	1	0.3
1987	Vegetation	–	–	3	–	–	–	216	<1	<1	<0.1
1988	All resources	–	–	50	–	–	–	614,669	656	204	100.0
1988	Salmon	–	–	1	–	–	80	490	1	<1	0.1
1988	Non-salmon fish	–	–	14	–	–	38,005	50,571	54	17	8.2
1988	Large land mammals	–	–	27	–	–	1,599	207,005	221	69	33.7
1988	Small land mammals	–	–	–	–	–	152	0	0	0	0.0
1988	Marine mammals	–	–	39	–	–	654	334,069	357	111	54.3
1988	Migratory birds	–	–	34	–	–	7,832	21,419	23	7	3.5
1988	Upland game birds	–	–	9	–	–	1,350	945	1	<1	0.2
1988	Vegetation	–	–	2	–	–	–	169	<1	<1	<0.1
1989	All resources	–	–	61	–	–	–	872,092	931	289	100.0
1989	Salmon	–	–	10	–	–	2,088	12,244	13	4	1.4
1989	Non-salmon fish	–	–	13	–	–	66,199	106,226	113	35	12.2
1989	Large land mammals	–	–	39	–	–	1,705	214,676	229	71	24.6
1989	Small land mammals	–	–	2	–	–	68	7	<1	0	<0.1
1989	Marine mammals	–	–	45	–	–	591	508,181	542	169	58.3
1989	Migratory birds	–	–	37	–	–	12,539	29,215	31	10	3.3
1989	Upland game birds	–	–	5	–	–	329	231	<1	<1	<0.1
1989	Vegetation	–	–	–	–	–	–	1,312	1	<1	0.2
1992[c]	All resources	–	–	–	–	–	–	1,363,738	–	–	100.0
1992[c]	Salmon	–	–	–	–	–	1,161	8,236	–	–	0.6
1992[c]	Non-salmon fish	–	–	–	–	–	50,596	87,769	–	–	6.4
1992[c]	Large land mammals	–	–	–	–	–	2,033	250,447	–	–	18.4
1992[c]	Small land mammals	–	–	–	–	–	260	35	–	–	<0.1
1992[c]	Marine mammals	–	–	–	–	–	1,080	991,528	–	–	72.7
1992[c]	Migratory birds	–	37	–	–	–	10,223	22,922	–	–	1.7
1992[c]	Upland game birds	–	–	–	–	–	1,332	933	–	–	0.1

Study Year	Resource	Percentage of Households Use	Percentage of Households Try to Harvest	Percentage of Households Harvest	Percentage of Households Give	Percentage of Households Receive	Estimated Harvest Number[a]	Estimated Harvest Total Pounds[b]	Estimated Harvest Average Household Pounds	Estimated Harvest Per Capita Pounds	Percentage of Total Harvest
1992[c]	Eggs	–	–	–	–	–	89	13	–	–	<0.1
1992[c]	Marine invertebrates	–	–	–	–	–	1,774	694	–	–	0.1
1992[c]	Vegetation	–	16	–	–	–	291	1,164	–	–	0.1
1995–1996	All resources	–	–	–	–	–	-	1,179,541	922	282	100.0
1995–1996	Salmon	–	–	–	–	–	288	1,326	1	<1	0.1
1995–1996	Non-salmon fish	–	–	–	–	–	29,334	53,794	42	13	4.6
1995–1996	Large land mammals	–	–	–	–	–	2,155	293,094	229	70	24.8
1995–1996	Small land mammals	–	–	–	–	–	220	115	<1	<1	<0.1
1995–1996	Marine mammals	–	–	–	–	–	886	788,185	616	189	66.8
1995–1996	Migratory birds	–	–	–	–	–	14,725	35,032	27	8	3.0
1995–1996	Upland game birds	–	–	–	–	–	152	117	<1	<1	<0.1
1995–1996	Eggs	–	–	–	–	–	21	3	<1	<1	<0.1
1995–1996	Marine invertebrates	–	–	–	–	–	2,208	6,624	5	2	0.6
1995–1996	Vegetation	–	–	–	–	–	27	109	<1	<1	<0.1
1996–1997	All resources	–	–	–	–	–	–	957,306	837	225	100.0
1996–1997	Salmon	–	–	–	–	–	345	2,011	2	<1	0.2
1996–1997	Non-salmon fish	–	–	–	–	–	27,469	38,333	34	9	4.0
1996–1997	Large land mammals	–	–	–	–	–	1,158	157,420	138	37	16.4
1996–1997	Small land mammals	–	–	–	–	–	157	181	<1	<1	<0.1
1996–1997	Marine mammals	–	–	–	–	–	482	746,965	653	176	78.0
1996–1997	Migratory birds	–	–	–	–	–	4,472	12,210	11	3	1.3
1996–1997	Upland game birds	–	–	–	–	–	224	172	<1	<1	<0.1
1996–1997	Vegetation	–	–	–	–	–	4	14	<1	<1	<0.1
2000	All resources	–	–	–	–	–	–	1,436,020	1255	313	100.0
2000	Salmon	–	–	–	–	–	2,100	11,302	10	2	0.8
2000	Non-salmon fish	–	–	–	–	–	78,065	117,945	103	26	8.2
2000	Large land mammals	–	–	–	–	–	3,382	459,632	402	100	32.0
2000	Small land mammals	–	–	–	–	–	424	453	<1	<1	<0.1
2000	Marine mammals	–	–	–	–	–	1,491	800,582	700	175	55.8
2000	Migratory birds	–	–	–	–	–	15,645	43,949	38	10	3.1
2000	Upland game birds	–	–	–	–	–	1,071	824	1	<1	0.1
2000	Eggs	–	–	–	–	–	2	2	<1	<1	<0.1
2000	Marine invertebrates	–	–	–	–	–	36	109	<1	<1	<0.1
2000	Vegetation	–	–	–	–	–	71	240	<1	<1	<0.1
2001	All resources	–	–	–	–	–	–	1,015,248	887	228	100.0
2001	Salmon	–	–	–	–	–	332	1,949	2	<1	0.2
2001	Non-salmon fish	–	–	–	–	–	4,453	10,165	9	2	1.0
2001	Large land mammals	–	–	–	–	–	1,825	247,991	217	56	24.4

Study Year	Resource	Percentage of Households Use	Percentage of Households Try to Harvest	Percentage of Households Harvest	Percentage of Households Give	Percentage of Households Receive	Estimated Harvest Number[a]	Estimated Harvest Total Pounds[b]	Estimated Harvest Average Household Pounds	Estimated Harvest Per Capita Pounds	Percentage of Total Harvest
2001	Small land mammals	–	–	–	–	–	91	91	<1	<1	<0.1
2001	Marine mammals	–	–	–	–	–	777	733,448	641	165	72.2
2001	Migratory birds	–	–	–	–	–	6,390	18,815	16	4	1.9
2001	Upland game birds	–	–	–	–	–	1,029	793	1	<1	0.1
2001	Marine invertebrates	–	–	–	–	–	13	38	<1	<1	<0.1
2001	Vegetation	–	–	–	–	–	3	14	<1	<1	<0.1
2003	All resources	–	–	–	–	–	–	1,357,357	970	305	100.0
2003	Salmon	–	–	–	–	–	3,995	24,463	17	5	1.8
2003	Non-salmon fish	–	–	–	–	–	20,109	67,680	48	15	5.0
2003	Large land mammals	–	–	–	–	–	2,093	284,587	203	64	21.0
2003	Small land mammals	–	–	–	–	–	94	50	<1	<1	<0.1
2003	Marine mammals	–	–	–	–	–	1,551	952,837	681	214	70.2
2003	Migratory birds	–	–	–	–	–	8,119	21,261	15	5	1.6
2003	Upland game birds	–	–	–	–	–	443	343	<1	<1	<0.1
2003	Eggs	–	–	–	–	–	12	12	<1	<1	<0.1
2003	Marine invertebrates	–	–	–	–	–	1,733	5,198	4	1	0.4
2003	Vegetation	–	–	–	–	–	61	219	<1	<1	<0.1
2014	All resources	89	57	52	63	87	–	–	1,214	362	100.0
2014	Salmon	69	26	24	26	55	12,087	57,262	36	11	3.0
2014	Non-salmon fish	69	29	27	37	60	106,555	196,049	124	37	10.2
2014	Large land mammals	72	39	33	39	57	4,335	595,004	376	112	30.9
2014	Small land mammals	8	6	5	2	4	1,474	0	0	0	0.0
2014	Marine mammals	71	30	18	45	70	1,792	1,020,943	645	192	53.1
2014	Migratory birds	53	32	29	29	35	19,049	48,271	31	9	2.5
2014	Upland game birds	9	9	8	4	1	911	638	0	0	<0.1
2014	Eggs	13	7	7	3	7	3,688	1,113	1	0	0.1
2014	Marine invertebrates	7	2	2	2	5	561	1,096	1	0	0.1
2014	Vegetation	43	18	16	15	35	853	2,975	2	1	0.2

Source: 1995–1996, 1996–1997, 2000, 2001, 2003 (Bacon, Hepa et al. 2009); 2014 (Brown, Braem et al. 2016); 1992 (Fuller and George 1999); 1987–1989 (SRB&A and ISER 1993)
Note: "–" (No Data). "All Resources" study years are years where studies addressed all subsistence resources harvested by the community, rather than selected resources or species.
[a] Estimated numbers represent individuals in all cases except vegetation, where they represent gallons. The estimated harvest numbers for the 1995–1996, 1996–1997, 2000, 2001, and 2003 data were derived by summing individual species in each resource category.
[b] Estimated pounds include only edible pounds and therefore do not include estimates for resources that are not typically eaten by community residents (e.g., furbearers). The total pounds for the 1995–1996, 1996–1997, 2000, 2001, and 2003 data were derived from conversion rates found at ADF&G (2018) and total (usable) pounds for bowhead whales were calculated based on the method presented in SRB&A and ISER (1993). These estimates do not account for whale girth and should be considered approximate; more exact methods for estimating total whale weights are available in George et al. (n.d.).
[c] Household participation for the 1992 study year is based on Table A5 in Fuller and George (1999); participation in migratory bird harvests includes waterfowl and eggs. Participation in vegetation harvests includes only berries.

Participation in subsistence activities by Utqiaġvik households is relatively high. Available data show that at least half of Utqiaġvik households successfully harvested subsistence resources during each of the study years (Table E.16.11). An even higher percentage of households used subsistence resources; in 2014, 89% of Utqiaġvik households used subsistence resources. Household participation rates were particularly high in harvests of marine mammals, migratory birds, large land mammals, and non-salmon fish (Table E.16.11). Sharing is an important tool for maintaining social networks and distributing food throughout the community. In 2014, 87% of Utqiaġvik households received subsistence resources and 63% gave subsistence resources away. The most commonly received resources included marine mammals, non-salmon fish, and large land mammals.

Table E.16.12. Utqiaġvik Subsistence Harvest Estimates by Resource Category, Single-Resource Study Years

Study Year	Resource	Percentage of Households Use	Percentage of Households Try to Harvest	Percentage of Households Harvest	Percentage of Households Give	Percentage of Households Receive	Estimated Harvest Number	Estimated Harvest Total Pounds	Estimated Harvest Average Household Pounds	Estimated Harvest Per Capita Pounds
2005	Birds	–	–	–	–	–	10,943	–	–	–
2007	Birds	–	–	–	–	–	38,152	–	–	–
2008	Birds	–	–	–	–	–	35,250	–	–	–
2009	Birds*	–	–	–	–	–	8,664	–	–	–
2005	Eggs	–	–	–	–	–	32	–	–	–
2007	Eggs	–	–	–	–	–	1,783	–	–	–
2008	Eggs	–	–	–	–	–	204	–	–	–
2009	Eggs	–	–	–	–	–	88	–	–	–

Source: 2005, 2007, 2008, 2009 (Naves and Braem 2014)
Note: "–" (No Data). Estimated harvest number for birds includes upland game birds and migratory birds combined.

Table E.16.13. Utqiaġvik Subsistence Harvest Estimates by Selected Species, All Study Years

Study Year	Resource[a]	Percentage of Households Use	Percentage of Households Try to Harvest	Percentage of Households Harvest	Percentage of Households Give	Percentage of Households Receive	Estimated Harvest Number[b]	Estimated Harvest Total Pounds[c]	Estimated Harvest Average Household Pounds	Estimated Harvest Per Capita Pounds	Percentage of Total Harvest
1987	Caribou	–	–	26	–	–	1,595	186,669	199	62	30.1
1987	Bowhead whale	–	–	31	–	–	7	184,629	197	61	29.7
1987	Walrus	–	–	11	–	–	84	64,663	69	21	10.4
1987	Bearded seal	–	–	25	–	–	236	41,518	44	14	6.7
1987	Broad whitefish	–	–	11	–	–	10,579	27,519	29	9	4.4
1987	Moose	–	–	6	–	–	52	25,786	28	9	4.2
1987	Ringed seal	–	–	14	–	–	466	19,574	21	6	3.2
1987	White-fronted Geese	–	–	16	–	–	2,417	10,879	12	4	1.8
1987	Unknown whitefish	–	–	3	–	–	5,108	10,215	11	3	1.6
1987	Arctic grayling	–	–	14	–	–	12,664	10,131	11	3	1.6
1987	Unknown Eider	–	–	21	–	–	5,080	7,621	8	3	1.2
1987	Least cisco	–	–	–	–	–	7,024	7,024	8	2	1.1
1988	Bowhead whale	–	–	35	–	–	11	233,313	249	77	38.0
1988	Caribou	–	–	27	–	–	1,533	179,314	191	59	29.2
1988	Walrus	–	–	6	–	–	61	47,215	50	16	7.7
1988	Bearded seal	–	–	11	–	–	179	31,436	34	10	5.1
1988	Broad whitefish	–	–	11	–	–	11,432	29,423	31	10	4.8
1988	Moose	–	–	4	–	–	53	26,367	28	9	4.3

Study Year	Resource[a]	Percentage of Households Use	Percentage of Households Try to Harvest	Percentage of Households Harvest	Percentage of Households Give	Percentage of Households Receive	Estimated Harvest Number[b]	Estimated Harvest Total Pounds[c]	Estimated Harvest Average Household Pounds	Estimated Harvest Per Capita Pounds	Percentage of Total Harvest
1988	Ringed seal	–	–	10	–	–	388	16,304	17	5	2.7
1988	White-fronted Geese	–	–	19	–	–	3,035	13,657	15	5	2.2
1988	Least cisco	–	–	2	–	–	–	7,505	8	2	1.2
1988	Arctic grayling	–	–	11	–	–	8,684	6,947	7	2	1.1
1988	Unknown Eider	–	–	20	–	–	4,454	6,682	7	2	1.1%
1989	Bowhead whale	–	–	45	–	–	10	377,647	403	125	43.3
1989	Caribou	–	–	39	–	–	1,656	193,744	207	64	22.2
1989	Broad whitefish	–	–	–	–	–	30,047	78,921	84	26	9.0
1989	Walrus	–	–	13	–	–	101	77,987	83	26	8.9
1989	Moose	–	–	6	–	–	40	20,014	21	7	2.3
1989	Polar bear	–	–	4	–	–	39	19,471	21	6	2.2
1989	Bearded seal	–	–	11	–	–	109	19,152	20	6	2.2
1989	Ringed Seal	–	–	11	–	–	328	13,774	15	5	1.6
1989	White-fronted Geese	–	–	12	–	–	2,932	13,193	14	4	1.5
1989	Unknown Eider	–	–	37	–	–	8,406	12,610	13	4	1.4
1989	Humpback Whitefish	–	–	10	–	–	3,648	9,119	10	3	1.0
1992[d]	Bowhead whale	–	–	–	–	–	22	729,952	–	–	53.5
1992[d]	Caribou	–	46	–	–	–	1,993	233,206	–	–	17.1
1992[d]	Walrus	–	26	–	–	–	206	159,236	–	–	11.7
1992[d]	Bearded seal	–	–	–	–	–	463	81,471	–	–	6.0
1992[d]	Broad whitefish	–	–	–	–	–	23,997	59,993	–	–	4.4
1992[d]	Moose	–	–	–	–	–	34	17,115	–	–	1.3
1995–1996	Bowhead Whale	–	–	–	–	–	19	582,283	455	139	49.4
1995–1996	Caribou	–	–	–	–	–	2,155	293,094	229	70	24.8
1995–1996	Bearded Seal	–	–	–	–	–	431	123,352	96	30	10.5
1995–1996	Walrus	–	–	–	–	–	74	56,672	44	14	4.8
1995–1996	Unknown Eider	–	–	–	–	–	12,064	26,631	21	6	2.3
1995–1996	Ringed Seal	–	–	–	–	–	345	19,665	15	5	1.7
1995–1996	Broad Whitefish	–	–	–	–	–	5,130	16,415	13	4	1.4
1995–1996	Rainbow Smelt	–	–	–	–	–	2,164	12,983	10	3	1.1
1996–1997	Bowhead Whale	–	–	–	–	–	24	616,555	539	145	64.4
1996–1997	Caribou	–	–	–	–	–	1,158	157,420	138	37	16.4
1996–1997	Walrus	–	–	–	–	–	78	59,752	52	14	6.2
1996–1997	Bearded Seal	–	–	–	–	–	192	54,998	48	13	5.7
1996–1997	Broad Whitefish	–	–	–	–	–	6,684	21,388	19	5	2.2
1996–1997	Least Cisco	–	–	–	–	–	16,519	11,563	10	3	1.2
1996–1997	Ringed Seal	–	–	–	–	–	180	10,243	9	2	1.1
2000	Bowhead Whale	–	–	–	–	–	18	462,822	405	101	32.2
2000	Caribou	–	–	–	–	–	3,359	456,851	399	100	31.8
2000	Bearded Seal	–	–	–	–	–	729	208,380	182	45	14.5
2000	Walrus	–	–	–	–	–	115	88,781	78	19	6.2
2000	Broad Whitefish	–	–	–	–	–	21,318	68,217	60	15	4.8
2000	Ringed Seal	–	–	–	–	–	586	33,379	29	7	2.3
2000	White-fronted Geese	–	–	–	–	–	7,455	23,708	21	5	1.7
2000	Least Cisco	–	–	–	–	–	23,839	16,687	15	4	1.2
2000	Grayling	–	–	–	–	–	15,228	13,705	12	3	1.0

Study Year	Resource[a]	Percentage of Households Use	Percentage of Households Try to Harvest	Percentage of Households Harvest	Percentage of Households Give	Percentage of Households Receive	Estimated Harvest Number[b]	Estimated Harvest Total Pounds[c]	Estimated Harvest Average Household Pounds	Estimated Harvest Per Capita Pounds	Percentage of Total Harvest
2001	Bowhead Whale	–	–	–	–	–	27	525,899	460	118	51.8
2001	Caribou	–	–	–	–	–	1,820	247,520	216	56	24.4
2001	Walrus	–	–	–	–	–	123	95,018	83	21	9.4
2001	Bearded Seal	–	–	–	–	–	327	93,522	82	21	9.2
2001	Ringed Seal	–	–	–	–	–	287	16,342	14	4	1.6
2001	White-fronted Geese	–	–	–	–	–	3,939	12,526	11	3	1.2
2003	Bowhead Whale	–	–	–	–	–	16	457,034	327	103	33.7
2003	Caribou	–	–	–	–	–	2,092	284,444	203	64	21.0
2003	Walrus	–	–	–	–	–	313	241,318	172	54	17.8
2003	Bearded Seal	–	–	–	–	–	776	221,965	159	50	16.4
2003	Capelin (grunion)	–	–	–	–	–	5,285	31,708	23	7	2.3
2003	Broad Whitefish	–	–	–	–	–	8,207	26,263	19	6	1.9
2003	Ringed Seal	–	–	–	–	–	413	23,513	17	5	1.7
2014	Caribou	70	38	33	38	52	4,323	587,897	371	111	30.6
2014	Bowhead	70	24	12	43	67	18	546,085	345	103	28.4
2014	Bearded seal	44	22	15	27	32	1,070	306,097	193	58	15.9
2014	Broad whitefish	54	22	20	29	40	43,962	140,679	89	26	7.3
2014	Walrus	31	11	4	17	27	135	103,602	65	19	5.4
2014	White-fronted Geese	39	23	22	20	22	9,595	29,745	19	6	1.5
2014	Ringed seal	19	10	8	11	11	428	24,402	15	5	1.3
2014	Beluga	15	4	0	9	14	25	24,341	15	5	1.3
2014	Chum salmon	24	13	11	10	15	4,039	24,312	15	5	1.3
2014	Sockeye salmon	29	9	9	11	23	4,630	18,667	12	4	1.0
2015	Caribou	–	44	–	–	–	3,000	351,000	–	–	–
2019	Caribou	–	–	–	–	–	3,273	–	–	–	–

Source: 1995–1996, 1996–1997, 2000, 2001, 2003 (Bacon, Hepa et al. 2009); 1995–1996, 1996–1997, 2000, 2001, 2003 (Brown, Braem et al. 2016); 1992 (Fuller and George 1999); 1987, 1988, 1999 (SRB&A and ISER 1993); 2015 (SRB&A 2017b); 2019 (NSB 2020).
Note: "–" (No Data).
[a] This table shows individual species unless they are not available for a given study year. For all resources study years (1987, 1988, 1989, 1992, 1995–1996, 1996–1997, 2000, 2001, and 2003), species are listed in descending order by their percentage of the total harvest and are limited to species accounting for at least 1% of the total harvest; for single-resource study years, species are listed in descending order by the total estimated pounds (or total number harvested in the case of salmon study years) and limited to the five top species. Years lacking "percentage of total harvest" data were not comprehensive (i.e., all resources) study years.
[b] Estimated numbers represent individuals in all cases except vegetation, where they represent gallons. The estimated harvest numbers for the 1995–1996, 1996–1997, 2000, 2001, and 2003 data were derived by summing individual species in each resource category.
[c] Estimated pounds include only edible pounds and therefore do not include estimates for resources that are not typically eaten by community residents (e.g., furbearers). The total pounds for the 1995–1996, 1996–1997, 2000, 2001, and 2003 data were derived from conversion rates found at ADF&G (2018), and total (usable) pounds for bowhead whales were calculated based on the method presented in SRB&A and ISER (1993). These estimates do not account for whale girth and should be considered approximate; more exact methods for estimating total whale weights are available in George et al. (n.d.).
[d] Household participation for the 1992 study year based on Table A5 in Fuller and George (1999).

1.2.2.2.1 Direct Effects Analysis Area

Utqiaġvik harvesters primarily use the direct effects analysis area to hunt for wolf, wolverine, moose, and caribou; a small number of Utqiaġvik harvesters have reported using the area for harvests of seal and goose. As shown in Table E.16.13, caribou are among the top species harvested, in terms of edible weight, by the community of Utqiaġvik. During the most recent study year (2014), over one-third (38%) of Utqiaġvik households participated in hunting caribou (the percentage would likely be higher among Native households only). Moose harvests have accounted for up to 4% of the harvest in some years; however, in recent years, these harvests have contributed less than 1% of the harvest. Similar to Nuiqsut, wolf and wolverine hunting is practiced by a smaller proportion of households; 6% of households

participated in the harvest of small land mammals in 2014 (Table E.16.11; this percentage was also likely higher among Native households). However, furbearer hunting and associated income and activities are an important component of Iñupiat culture, and Utqiaġvik furbearer harvesters often expend substantial time, money, and effort in their pursuits. Data on harvest amounts specific to the direct effects analysis area are not available for Utqiaġvik.

Based on data from SRB&A (2010b), which collected subsistence use areas for key resources for the 1997–2006 time period, the direct effects analysis area is used by moose hunters (44% of harvesters), wolf and wolverine hunters (29% of harvesters), and caribou hunters (26% of harvesters) (Table E.16.14). The Colville River drainage is a primary moose hunting area on the North Slope, and some Utqiaġvik residents will travel to the Nuiqsut area by plane or boat to access this harvesting area. A small number of individuals have reported traveling to the direct effects analysis area to harvest bearded seal, ringed seal, and goose (2% of harvesters or less). For resources as a whole, approximately one-quarter (31%) of Utqiaġvik harvesters reported using the direct effects analysis area for subsistence purposes during the 1997–2006 time period (Table E.16.14).

Table E.16.14. Utqiaġvik Harvesters Using the Direct Effects Analysis Area, 1997–2006

Resource Category	Total Number of Respondents for Resource	Number of Respondents in Direct Effects Analysis Area	Percentage of Utqiaġvik Resource Respondents
Wolverine	31	9	29%
Wolf	31	9	29%
Caribou	73	19	26%
Moose	9	4	44%
Bearded seal	63	1	2%
Ringed seal	48	1	2%
Goose	71	1	1%
All resources	**75**	**23**	**31%**

Source: SRB&A 2010b

1.2.2.3 Timing of Subsistence Activities

Table E.16.15 provides data on the timing of Utqiaġvik subsistence activities based on reports from the 1980s through the 2010s. Overall, Utqiaġvik harvesters target the greatest number of resources in August and September. These months are a primary time for harvests of non-salmon fish, salmon, caribou, moose and other large land mammals, marine mammals, and plants and berries.

Table E.16.15. Utqiaġvik Annual Cycle of Subsistence Activities

Resource	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Freshwater non-salmon	L	L	L	L	M	M	H	H	H	H	M	L
Marine non-salmon	L	L	L	–	–	L	M	H	H	M	L	–
Salmon	–	–	–	–	L	L	H	H	M	L	–	–
Caribou	L	L	L	L	L	L	H	H	H	H	L	L
Moose	–	L	L	M	M	M	M	H	H	–	–	–
Bear	–	–	–	L	L	L	L	M	H	L	–	–
Dall sheep	–	–	H	–	–	–	–	L	–	–	–	–
Muskox	–	–	H	–	–	–	–	–	H	–	–	–
Furbearers	H	H	H	M	L	L	–	–	L	M	H	H
Small land mammals	–	L	L	H	H	L	M	L	M	L	L	–
Marine mammals	L	L	L	M	M	M	H	H	H	M	M	L
Upland birds	L	L	L	M	H	M	L	L	L	L	L	L
Waterfowl	L	L	L	M	H	M	L	L	L	L	L	L
Marine invertebrates	–	–	–	–	–	M	L	M	H	L	L	–
Plants and berries	–	–	–	–	L	L	L	H	M	–	–	–
Total number of resource categories by month	**7**	**9**	**11**	**9**	**11**	**13**	**12**	**13**	**14**	**11**	**9**	**6**

Source: (Bacon, Hepa et al. 2009; Braem, Kaleak et al. 2011; Brown, Braem et al. 2016; EDAW Inc., Adams/Russel Consulting et al. 2008; Schneider, Pedersen et al. 1980; SRB&A 2010b; SRB&A and ISER 1993; SRB&A 2017b)
Note: "–" (no documented activity and/or harvests); H (high activity and/or harvests); L (limited activity and/or harvests); M (moderate activity and/or harvests).

The spring subsistence season (April and May) in Utqiaġvik is primarily dedicated to hunting bowhead whales, with some additional harvests of other marine mammals, including seals and polar bears. Hunting waterfowl such as eiders and white-fronted goose begins during these spring months (Brown, Braem et al. 2016) and, particularly for eiders, continues into the summer months. Harvests of goose peak in May and eider hunting occurs offshore during the spring whaling season (generally when leads are closed and whaling crews are not actively hunting whales).

The summer months (June–August) are a time of diversified subsistence activity when residents travel into the ocean and along various river systems in pursuit of marine, terrestrial, and riverine resources. A primary focus during the summer and fall months is hunting marine mammals (e.g., bearded and ringed seals, walruses) offshore as they migrate north with the floe ice, with eiders often a secondary target. Residents travel along the coast and inland during the summer months to hunt caribou and harvest a variety of fish in lagoons and rivers. The peak caribou hunting season is in July and August when they are available to hunters traveling by boat along the coast and on local waterways. Residents also harvest berries and other vegetation during these boating trips.

The fall bowhead whale hunt is a major focus during September and October. In addition, caribou, fish, and birds remain sought-after resources throughout fall. During August and September, some Utqiaġvik residents may travel to the Colville River to harvest moose and berries (Brown, Braem et al. 2016; Fuller and George 1999). Bacon et al. (2009) and SRB&A (2010b) also show some eider duck harvesting continuing into these fall months. The subsistence fish harvest generally peaks in October (under-ice fishery) when whitefish and Arctic grayling are concentrated at overwintering areas. The winter months (November–March) are primarily spent hunting and trapping furbearers, in addition to harvesting caribou, ringed seals, upland birds (ptarmigan), the occasional polar bear, and fish.

1.2.2.3.1 Direct Effects Analysis Area

Utqiaġvik harvesters use the direct effects analysis area at varying levels throughout the year (Figure E.16.21). For all resources for the 1997–2006 time period, use of the direct effects analysis area is highest in February and March, with lower levels occurring throughout the rest of the year. Caribou hunting in the direct effects analysis area peaks during February and March and during July and August. Moose hunting occurs solely in August and September. Wolf and wolverine hunters use the direct effects analysis area solely during November through April, with a peak in February and March, when snow conditions allow for extensive overland travel and furs are prime. The limited seal and goose hunting reported by Utqiaġvik harvesters occurs primarily during the spring (April and May for seal; May and June for goose).

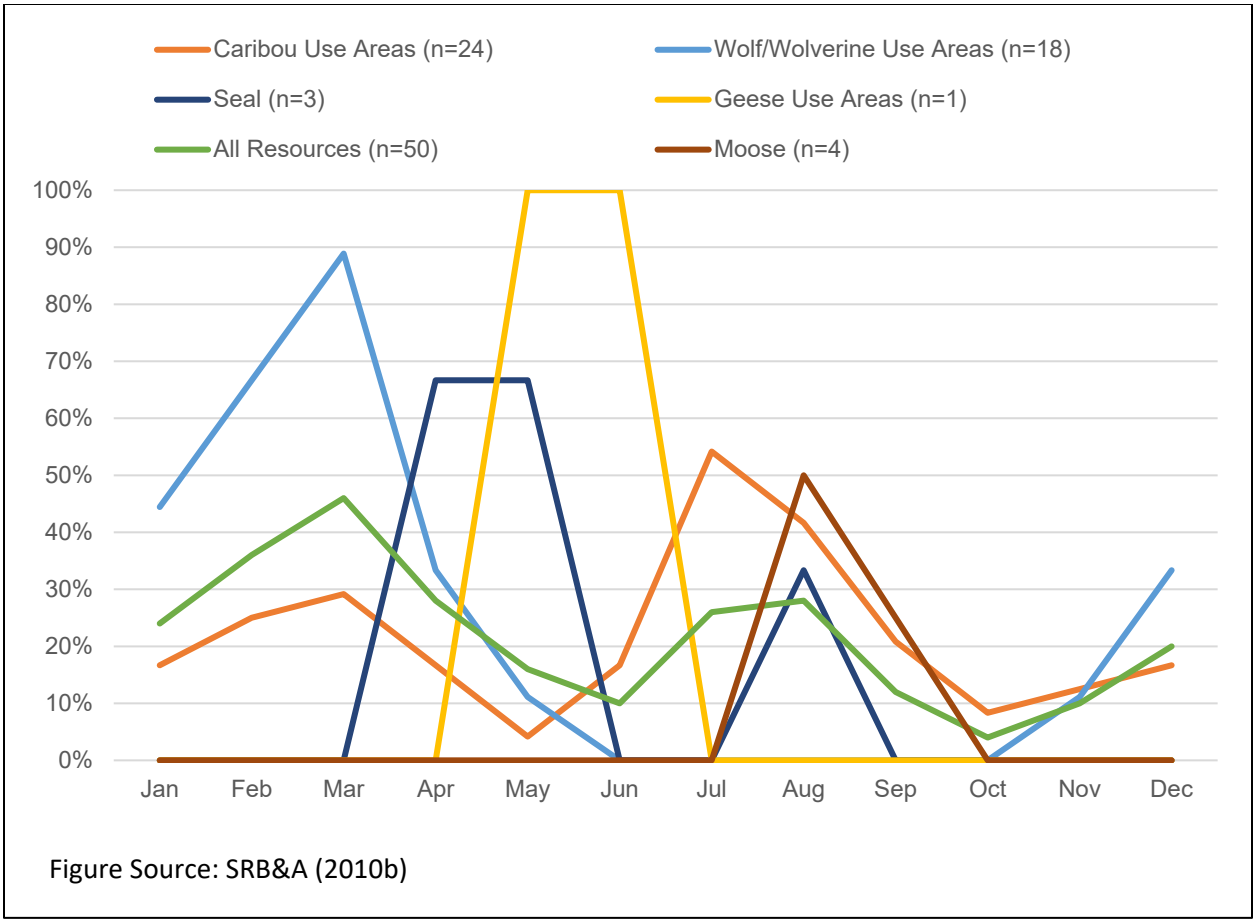

Figure E.16.21. Utqiaġvik Subsistence Use Areas by Month in the Direct Effects Analysis Area, by Resource

1.2.2.4 Travel Methods

Table E.16.16 shows the primary travel methods used for key species, as documented in SRB&A (2010b). Boat is the primary method of travel used by Utqiaġvik residents for subsistence pursuits of certain non-salmon fish, caribou, bowhead whale, seals, walrus, and eider. Snow machine is the primary method for late fall and winter pursuits of Arctic cisco, burbot, moose, wolf, wolverine, and goose. To a lesser extent, Utqiaġvik residents also travel by foot, car/truck, ATV, and plane to access subsistence use areas.

Table E.16.16. Utqiaġvik Travel Method to Subsistence Use Areas

Resources	Boat	Snow Machine	Foot	Car/Truck	ATV	Plane
Arctic cisco and burbot	M	H	–	L	L	M
Arctic char/Dolly Varden and broad whitefish	H	M	–	M	M	L
Caribou	H	M	L	L	M	L
Moose	M	H	–	–	–	–
Wolf and wolverine	–	H	–	–	–	–
Bowhead whale	H	M	–	–	–	–
Seals	H	M	–	–	–	–
Walrus	H	L	–	–	–	–
Goose	M	H	L	L	M	L
Eider	H	M	L	M	L	–

Source: 1996–2007 (SRB&A 2010b)
Note: "–" (no documented use of travel method); ATV (all-terrain vehicle); H (high use of travel method); L (limited use of travel method); M (moderate use of travel method).

1.2.2.4.1 Direct Effects Analysis Area

As shown in Figure E.16.22, for the 1997–2006 time period, snow machine was the primary method used to access the direct effects analysis area (58% of use areas), followed by boat (42%). Snow machine/overland travel generally occurs between November and April (Figure E.16.21), whereas coastal and riverine boat travel generally occurs from June through September.

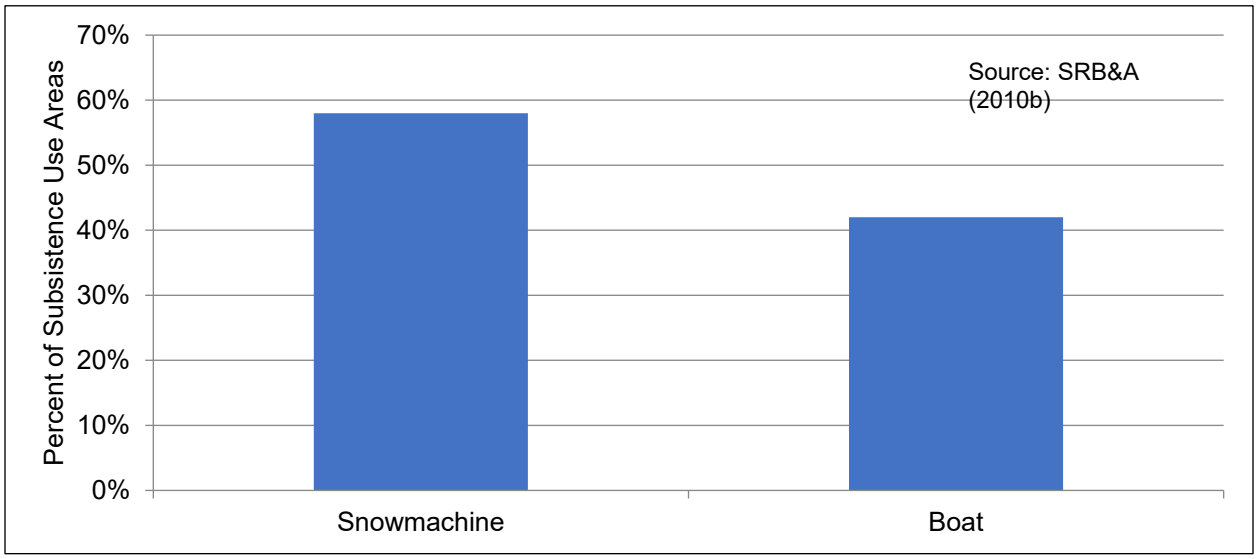

Figure E.16.22. Utqiaġvik Travel Methods, Direct Effects Analysis Area

1.2.2.5 Resource Importance

An analysis of resource importance for Utqiaġvik based on harvest (average percentage of total harvest), harvest effort (average percentage of households attempting to harvest) and sharing (average percentage of households receiving) variables is provided in Table E.16.17. Based on this analysis, resources of major importance in Utqiaġvik are bearded seal, bowhead whale, and caribou.

Table E.16.17. Relative Importance of Subsistence Resources Based on Selected Variables, Utqiaġvik

Resource Importance	Resource[a]	Percentage of Households Trying to Harvest	Percentage of Households Receiving	Percentage of Total Harvest
Major resources[b]	Bearded seal	22	32	9.2
Major resources[b]	Bowhead whale	24	67	42.4
Major resources[b]	Caribou	43	52	24.8
Moderate resources[c]	Walrus	19	27	8.8
Moderate resources[c]	Broad whitefish	22	40	4.1
Moderate resources[c]	Moose	2	13	2.5
Moderate resources[c]	Ringed seal	10	11	1.8
Moderate resources[c]	White-fronted goose	23	22	1.3
Moderate resources[c]	Sockeye salmon	9	23	1
Moderate resources[c]	Arctic cisco	5	33	<1
Moderate resources[c]	Arctic grayling	13	17	<1
Moderate resources[c]	Beluga	4	14	<1
Moderate resources[c]	Blueberry	4	14	<1
Moderate resources[c]	Chinook/king salmon	5	12	<1
Moderate resources[c]	Chum/dog salmon	13	15	<1
Moderate resources[c]	Coho/silver salmon	9	20	<1
Moderate resources[c]	King eider	16	14	<1
Moderate resources[c]	Pink/humpback salmon	9	12	<1

Resource Importance	Resource[a]	Percentage of Households Trying to Harvest	Percentage of Households Receiving	Percentage of Total Harvest
Moderate resources[c]	Rainbow smelt	2	18	<1
Moderate resources[c]	Salmonberry/Cloudberry	12	30	<1
Minor resources[d]	Common eider	9	9	<1
Minor resources[d]	Halibut	3	8	<1
Minor resources[d]	Humpback whitefish	7	5	<1
Minor resources[d]	Least cisco	6	7	<1
Minor resources[d]	Polar bear	2	6	<1
Minor resources[d]	Ptarmigan	9	1	<1
Minor resources[d]	Sheefish	–	6	–
Minor resources[d]	Snow goose	5	2	<1
Minor resources[d]	Wolf	<5	<5	<1
Minor resources[d]	Wolverine	<5	<5	<1

Source: 1995 to 1996, 1996 to 1997, 2000, 2001, 2003 (Bacon, Hepa et al. 2009); 2014 (Brown, Braem et al. 2016); 1992 (Fuller and George 1999); 1987 to 1989 (SRB&A and ISER 1993); 2015 (SRB&A 2017b); 2019 (NSB 2020)

Note: "–" (resource was not harvested or no households attempted to harvest the resource).

[a] For space considerations, resources that contributed an average of less than 1% of the harvest, less than 5% attempting to harvest, and less than 5% receiving resources are categorized as minor and are not shown.

[b] Major resources contribute >9% of the total harvest, have ≥50% of households attempting to harvest, or have ≥50% of households receiving resources.

[c] Moderate resources contribute 2% to 9% of the total harvest, have 11% to 49% of households attempting to harvest, or have 11% to 49% of households receiving resources.

[d] Minor resources contribute <2% of the total harvest, have ≤10% of households attempting to harvest, or have ≤10% of households receiving resources. For space considerations, resources contributing an average of less than 1% of the harvest, less than 5% attempting to harvest, and less than 5% receiving resources are categorized as minor and are not shown. While wolf and wolverine fall below the threshold for inclusion (less than 1% of material importance and less than 5% of cultural importance), they are included because of their relevance to the analysis area.

2.0 COMPARISON OF ACTION ALTERNATIVES AND OPTIONS

Tables E.16.18 and E.16.19 summarize and compare impacts to subsistence use areas among the action alternatives and module delivery options.

Table E.16.18. Comparison of Impacts to Subsistence Uses for Nuiqsut*

Effects To	Alternative B: Proponent's Project	Alternative C: Disconnected Infield Roads	Alternative D: Disconnected Access	Alternative E: Three-Pad Alternative	Option 1: Atigaru Point Module Transfer Island	Option 2: Point Lonely Module Transfer Island	Option 3: Colville River Crossing
Resources (importance)	Caribou (major) Furbearers (minor)[a] Waterfowl (major) Fish (major)	Same as Alternative B	Same as Alternative B	Same as Alternative B	Caribou (major) Furbearers (minor)[a] Waterfowl (major) Seals (major)	Caribou (major) Furbearers (minor)[a] Waterfowl (major)	Caribou (major) Furbearers (minor) Waterfowl (major)
Resource abundance	No impacts to overall abundance expected	Same as Alternative B	Same as Alternative B	Same as Alternative B	No impacts to overall abundance expected	Same as Option 1	Same as Option 1
Resource availability	Caribou: Greatest potential for impacts to resource availability Furbearers: High likelihood of reduced furbearer availability near the Project Waterfowl, fish: Low likelihood as Project does not overlap with areas of high overlapping subsistence use and large-scale contamination events are unlikely	Caribou: Impacts to caribou resource availability reduced from Alternative B. Increase in air traffic impacts would be offset by decreased infrastructure and potential for deflection. Furbearers, waterfowl, fish: Same as Alternative B	Caribou: Least potential for impacts to resource availability. Increase in air traffic impacts would be offset by decreased infrastructure and potential for deflection. Furbearers, waterfowl, fish: Same as Alternative B	Caribou: Impacts to caribou resource availability reduced from Alternative B due to the reduction in length of road and other infrastructure. Furbearers, waterfowl, fish: Same as Alternative B	Caribou: Impacts are minimal due to the winter timing of activities Furbearers: High likelihood of reduced availability near ice roads Waterfowl: Moderate likelihood of reduced availability during one spring hunting season Seals: Moderate likelihood of reduced availability to individual hunters during multiple summers	Caribou: Impacts are minimal due to the winter timing of activities Furbearers: High likelihood of reduced furbearer availability near ice roads Waterfowl: Moderate likelihood of reduced waterfowl during one spring hunting season	Caribou: Impacts are minimal due to the winter timing of activities Furbearers: Moderate likelihood of reduced furbearer availability near ice roads during two hunting seasons Waterfowl: Low likelihood of reduced availability during two spring hunting seasons

Effects To	Alternative B: Proponent's Project	Alternative C: Disconnected Infield Roads	Alternative D: Disconnected Access	Alternative E: Three-Pad Alternative	Option 1: Atigaru Point Module Transfer Island	Option 2: Point Lonely Module Transfer Island	Option 3: Colville River Crossing
Harvester access	High likelihood of impacts during the construction phase due to the lack of ice road access on gravel haul ice roads near the community and barriers to overland travel due to high traffic levels Moderate likelihood of impacts during operation due to physical obstructions and safety considerations while hunting along roads Moderate likelihood of increased access although the use of roads may decrease with distance from the community	Same as Alternative B	High likelihood of impacts during the construction phase due to the lack of ice road access on gravel haul ice roads near the community and barriers to overland travel due to high traffic levels Lower likelihood of impacts to access during operation due to fewer physical obstructions to access. Impacts related to safety considerations would remain Low likelihood of increased access although the use of roads may decrease with distance from the community	Same as Alternative B	Caribou, furbearers, waterfowl: High likelihood of impacts during the construction phase due to the lack of ice road access on gravel haul and module transport ice roads near the community and barriers to overland travel due to high traffic levels Seals: Low to moderate likelihood of impacts as the module transfer island is on the periphery of the hunting area General: Low likelihood of changes to access in nearshore/coastal areas due to erosion/sedimentation	Caribou, furbearers, waterfowl: High likelihood of impacts during the construction phase due to the lack of ice road access on gravel haul ice roads near the community and barriers to overland travel due to high traffic levels	Caribou, furbearers: Moderate likelihood of impacts during the construction phase due to the periodic lack of ice road access on module transport ice roads in high-use winter hunting areas and potential barriers to overland travel
Community-level impacts	Impacts are most likely to occur for Nuiqsut Harvesters (up to 91% directly affected)	Same as Alternative B	Same as Alternative B	Same as Alternative B	Impacts are most likely to occur for Nuiqsut Harvesters (up to 94% directly affected)	Impacts are most likely to occur for Nuiqsut Harvesters (up to 94% directly affected)	Impacts are most likely to occur for Nuiqsut Harvesters (up to 91% directly affected)

[a] Despite being characterized as a resource of minor importance based on selected measures, furbearer hunting and trapping is a specialized activity with unique importance to Nuiqsut and Utqiaġvik.

Table E.16.19. Comparison of Impacts to Subsistence Uses for Utqiaġvik*

Effects To	Alternative B: Proponent's Project	Alternative C: Disconnected Infield Roads	Alternative D: Disconnected Access	Alternative E: Three -Pad Alternative	Option 1: Atigaru Point Module Transfer Island	Option 2: Point Lonely Module Transfer Island	Option 3: Colville River Crossing
Resources (importance)	Caribou (major) Furbearers (minor)[a]	Same as Alternative B	Same as Alternative B	Same as Alternative B	Caribou (major) Furbearers (minor)[a]	Same as Option 1	Same as Option 1
Resource abundance	No impacts to overall abundance expected	Same as Alternative B	Same as Alternative B	Same as Alternative B	No impacts to overall abundance expected	Same as Option 1	Same as Option 1
Resource availability	Caribou: Low potential for impacts to resource availability Furbearers: Low to moderate likelihood of reduced availability as the Project does not overlap with areas of high overlapping subsistence use but occurs to the east of moderate overlapping use	Same as Alternative B	Same as Alternative B	Same as Alternative B	Caribou: Low potential for impacts to resource availability Furbearers: Low to moderate likelihood of reduced availability as the Project does not overlap with areas of high overlapping subsistence use but occurs to the east of moderate overlapping use	Furbearers and caribou: Low to moderate likelihood of reduced availability as high-volume ice roads would occur directly to the east of high overlapping use to the south of Teshekpuk Lake	Caribou and furbearers: Low potential for impacts to resource availability due to the location of the ice road in the periphery of community use areas
Harvester access	Low likelihood of reduced access as the Project does not overlap with areas of high overlapping subsistence use Low likelihood of increased access	Same as Alternative B	Same as Alternative B	Same as Alternative B	Low likelihood of reduced access as the Project does not overlap with areas of high overlapping subsistence use	Same as Option 1	Same as Option 1
Community-level impacts	Impacts may occur for Utqiaġvik but are less likely (up to 12% directly affected)	Same as Alternative B	Same as Alternative B	Same as Alternative B	Impacts may occur for Utqiaġvik but are less likely (up to 11% directly affected)	Impacts are more likely to occur for Utqiaġvik harvesters under Option 2 (up to 23% of harvesters) compared to Option 1 (up to 11% of harvesters). In addition, the Point Lonely option is more likely to cause indirect impacts to Utqiaġvik harvesters than Option 1 because of its proximity to key Utqiaġvik harvesting areas at Teshekpuk Lake	Impacts could affect a higher percentage of Utqiaġvik harvesters under Option 3 (15% of harvesters) compared to Option 1 (11% of harvesters) but would be less likely because of the greater distance of the ice road infrastructure from the community

[a] Despite being characterized as a resource of minor importance based on selected measures, furbearer hunting and trapping is a specialized activity with unique importance to Nuiqsut and Utqiaġvik.

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Appendix E.17
Environmental Justice Technical Appendix

There is no technical appendix for this resource

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Appendix E.18
Public Health Technical Appendix

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List of Acronyms

BLM	Bureau of Land Management
DHSS	Alaska Department of Health and Social Services
HEC	health effects category
NSB	North Slope Borough

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1.0 PUBLIC HEALTH

Table E.18.1 describes the health effects categories (HECs) and Table E.18.2 provides an overview of the technical guidance for evaluating health impacts from resource development used to inform the health impact analysis. Guidance for evaluation comes from:

- Alaska Department of Health and Social Services (DHSS), *Alaska Health Impact Analysis Technical Guidance* (2015)
- North Slope Borough (NSB), *Health Impact Assessment for Natural Resource Development in Alaska Collaborative Guidance* (2015)
- Bureau of Land Management (BLM), *National Petroleum Reserve in Alaska Integrated Activity Plan/Environmental Impact Statement* (2020) health effects analysis

Table E.18.1. Health Effects Category Descriptions

Health Effects Category	Description
HEC1: Social determinants of health	Economic status, educational status, social support systems, employment status, mental health, maternal and child health, substance use, social exclusion, psychosocial distress, historical trauma, and family dynamics
HEC2: Accidents and injuries	Intentional and unintentional injuries with fatal and nonfatal results; traffic patterns, alcohol involvement, emergency services availability, presence of law enforcement, and presence of prevention programs
HEC3: Exposure to potentially hazardous materials	Documented illnesses or exacerbation of illnesses commonly associated with pollutants through inhalation, ingestion, or physical contact
HEC4: Food, nutrition, and subsistence activities	Nutrient levels, malnutrition, or improvements in nutrient intake, diet composition, food security, and consumption of subsistence foods
HEC5: Infectious disease	Rates of increase or decrease for a range of infectious diseases, such as sexually transmitted infections, respiratory illness, or skin infections; immunization rates; and the presence of infectious disease prevention efforts
HEC6: Water and sanitation	Changes to access, quantity, and quality of water supplies; distance to clean water, water fluoridation, indoor plumbing, water treatment facilities, and existence of community facilities, such as washaterias or community showers
HEC7: Non-communicable and chronic diseases	Increases/decreases in mortality and morbidity rates of cancer, cardiovascular and cerebrovascular diseases, diabetes, respiratory diseases, and mental health disorders; smoking rates, rates of alcohol and drug abuse, physical activity levels, presence of recreation centers, and cancer-screening rates
HEC8: Health services infrastructure and capacity	Increase or decrease in the number of medical evacuations, clinic or hospital visit trends, health expenditures, and medication usage; distance to health facilities, medevac facilities/aircraft, the presence of community health aides, and the frequency of physician visits to the area

Source: DHSS 2015
Note: HEC (health effects category)

Table E.18.2. Health Effect Factors from Relevant Guidance Documents

Alaska HIA Technical Guidance (ADHSS 2015)	HIA for Natural Resource Development in Alaska Collaborative Guidance (NSB 2015)	National Petroleum Reserve in Alaska IAP/EIS Health Effects Analysis (BLM 2020)
HEC1: Social determinants of health	Overall health and well-being Psychological and gender issues Maternal and child health	Acculturative stress Economic impacts on health
HEC2: Accidents and injuries	Accidents and injuries	Safety
HEC3: Exposure to potentially hazardous materials	Contaminant exposure	Environmental exposures
HEC4: Food, nutrition, and subsistence activities	Food, nutrition, and physical activity	Diet and nutrition
HEC5: Infectious disease	Infectious disease	Infectious disease
HEC6: Water and sanitation	Water and sanitation	NA
HEC7: Non-communicable and chronic diseases	Non-communicable/chronic diseases	NA
HEC8: Health services infrastructure and capacity	Health services infrastructure and capacity Occupational/community health interface	Health-care services

Note: HEC (health effects category); HIA (Health Impact Assessment); IAP/EIS (Integrated Activity Plan/Environmental Impact Statement); NA (not applicable)

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Appendix E.19
Cumulative Effects Technical Appendix

There is no technical appendix for this resource

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