FINAL
ENVIRONMENTAL IMPACT STATEMENT

For issuing annual catch limits to the Alaska Eskimo Whaling Commission for a subsistence hunt on bowhead whales for the years 2019 and beyond

November 2018

Prepared by
U.S. Department of Commerce
National Oceanic and Atmospheric Administration
National Marine Fisheries Service

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for
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November 2018

Lead Agency: U.S. Department of Commerce
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Office of International Affairs and Seafood Inspection

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Abstract: The National Oceanic and Atmospheric Administration's (NOAA) National Marine Fisheries Service (NMFS) proposes to issue annual catch limits to the Alaska Eskimo Whaling Commission (AEWC) to allow continuation of its subsistence hunt for bowhead whales from the Western Arctic stock from 2019 onward, under the Whaling Convention Act (WCA) and the Cooperative Agreement with the Alaska Eskimo Whaling Commission (AEWC), and subject to International Whaling Commission (IWC)-set catch limits. Under the International Convention for the Regulation of Whaling (ICRW), the IWC has adopted management principles for setting subsistence catch limits for the Western Arctic stock of bowhead whales based upon the needs of Native hunters in Alaskan villages and in Russian Federation villages along the Chukotka Peninsula, and may adopt catch limits for specific years. NMFS issues the AEWC the United States' share of this catch limit. The subsequent hunt is managed under the WCA and the Marine Mammal Protection Act (MMPA), cooperatively by NMFS and the AEWC.

The purpose of this action is twofold: to manage the conservation and sustainable subsistence utilization of the Western Arctic stock of bowhead whales (as required under the ICRW, the WCA, the MMPA, and other applicable laws) and to fulfill the Federal Government's trust responsibility to recognize the cultural and subsistence needs of Alaska Natives.

The IWC conducted its most recent meeting in September 2018 in Florianopolis, Brazil, and based on the management advice of the IWC Scientific Committee, extended the numerical catch limits for Western Arctic bowhead whales through 2025, and provided for increased flexibility in the conduct of the hunt and subsequent automatic renewal of these catch limits under specified circumstances

This EIS considers five Alternatives and Alternative 4 is the preferred alternative. Under Alternative 4, NMFS would grant the AEWC the U.S. portion of a maximum annual strike limit of 100 strikes, i.e., 67 annual strikes plus up to 33 unused strikes from previous years which can be carried forward, subject to limits, and added to the annual strike quota of subsequent years. These strike limits would be subject to the U.S. portion of a maximum total of 336 landed whales over any six-year period. This Alternative is preferred because it meets the purpose and need of this action, and it achieves the socio-cultural benefits of the subsistence hunt at minimal environmental cost.

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List of Acronyms and Abbreviations

2-D	two-dimensional
3-D	three-dimensional
AAC	Alaska Administrative Code
ABF	Alaska Board of Fisheries
ABSC	Alaska Bering Sea Crabbers
ACIA	Arctic Climate Impact Assessment
ADF&G	Alaska Department of Fish and Game
AEWC	Alaska Eskimo Whaling Commission
AGIA	Alaska Gasline Inducement Act
AMAP	Arctic Monitoring and Assessment Programme
AOGCM	Atmosphere-Ocean Global Climate Model
APP	Alaska Pipeline Project
ASAMM	Aerial Survey of Arctic Marine Mammals
ASAP	Alaska Stand Alone Gas Pipeline
AWI	Animal Welfare Institute
AWSC	Alaska Waterways Safety Committee
BCBS	Bering-Chuckchi-Beaufort Seas
Bcf	billion cubic feet
BOEM	Bureau of Ocean Energy Management
BOEMRE	Bureau of Ocean Energy Management, Regulation and Enforcement
BPXA	BP Exploration
BWASP	Bowhead Whale Aerial Survey Project
CAA	Conflict Avoidance Agreement
Cd	cadmium
CEQ	Council on Environmental Quality

CFR	Code of Federal Regulations
CI	Confidence Interval
cm	centimeters
CO_2	carbon dioxide
COP	ConocoPhillips Company
COPA	ConocoPhillips Alaska, Inc.
CPAI	ConocoPhillips Alaska, Inc.
CPF	Central Processing Facility
CV	Coefficient of Variation
dB	decibels
dB re 1 µPa at 1 m	decibels re 1 microPascal at 1 meter
DDTs	Dichlorodiphenyltrichloroethanes
DPSs	Distinct Population Segments
EA	Environmental Assessment
EEZ	Exclusive Economic Zone
EIS	Environmental Impact Statement
EO	Executive Order
EP	Exploration Plan
EPA	Environmental Protection Agency
ESA	Endangered Species Act
FR	Federal Register
FMP	Fishery Management Plan
FONSI	Finding of No Significant Impact
Fr	Recovery Factor
ft	feet
G&G	Geological and Geophysical
GMT-1	Greater Mooses Tooth-1 project

GMT-2	Greater Mooses Tooth-2 project
GTP	gas treatment plant
HCHs	hexachlorocyclohexanes
Hg	mercury
HPDI	Highest Posterior Density Intervals
Hz	hertz
ICRW	International Convention for the Regulation of Whaling
IHLC	Iñupiat History, Language and Culture Commission
ISER	Institute of Social and Economic Research
in^3	cubic inches
IPCC	Intergovernmental Panel on Climate Change
IWC	International Whaling Commission
K	carrying capacity
kHz	kilohertz
km	kilometers
LDPI	Liberty Development and Production Island
m	meters
mi.	miles
MHW	Mean High Water
MMC	Marine Mammal Commission
MML	Marine Mammal Laboratory
MMPA	Marine Mammal Protection Act
MMS	Minerals Management Service
MPRSA	Marine Protection, Research, and Sanctuaries Act
MSY	Maximum Sustainable Yield
N(#)	number of whales estimated to have passed within # km of visual range based on visual surveys from shore

n. mi.	nautical miles
N/A	not available
NBSRA	Northern Bering Sea Research Area
ND	no data
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NPFMC	North Pacific Fishery Management Council
NOAA	National Oceanic and Atmospheric Administration
NPR-A	National Petroleum Reserve in Alaska
NRC	National Research Council
NSB	North Slope Borough
NSF	National Science Foundation
NWFSC	Northwest Fisheries Science Center
OCs	Organochlorines
OCS	Outer Continental Shelf
ONR	Office of Naval Research
OSP	optimum sustainable population
P(#)	proportion of whales estimated to have passed within #km range based on acoustic data and aerial surveys
PAHs	polycyclic aromatic hydrocarbons
PBR	potential biological removal
PCBs	polychlorinated biphenyls
POP	Platforms of Opportunity Program
psi	pounds per square inch
Q	A catch control rule developed by the IWC Scientific Committee
RFFAs	reasonably foreseeable future actions
ROD	Record of Decision

ROI	rate of increase
RY	replacement yield
SBI	Shelf Basin Interactions
SE	Standard Error
Se	selenium
SEIS	Supplemental Environmental Impact Statement
SLA	Strike Limit Algorithm
SLP	Sea Level Pressure
SPL	Sound Pressure Level
st. mi.	statute miles
TAPS	Trans-Alaska Pipeline System
TEK	traditional ecological knowledge
TOX	toxaphene
U.S.	United States
U.S.C.	United States Code
USGS	U.S. Geological Survey
USACE	U.S. Army Corps of Engineers
USCG	U.S. Coast Guard
USFWS	United States Fish and Wildlife Service
VLOS	very large oil spill
WCA	Whaling Convention Act
WDC	Whale and Dolphin Conservation
WIP	Weapons Improvement Program
Y-K	Yukon-Kuskokwim

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EXECUTIVE SUMMARY

ES.1 Description of the Proposed Action

The National Oceanic and Atmospheric Administration's (NOAA) National Marine Fisheries Service (NMFS) proposes to issue annual catch limits to the Alaska Eskimo Whaling Commission (AEWC) to allow continuation of its subsistence hunt for bowhead whales from the Western Arctic stock from 2019 onward, under the Whaling Convention Act (WCA) and the Cooperative Agreement with the Alaska Eskimo Whaling Commission (AEWC), and subject to International Whaling Commission (IWC)-set catch limits. Under the International Convention for the Regulation of Whaling (ICRW), the IWC has adopted management principles for setting subsistence catch limits for the Western Arctic stock of bowhead whales based upon the needs of Native hunters in Alaskan villages and in Russian villages along the Chukotka Peninsula, and may adopt catch limits for specific years. NMFS issues the AEWC the United States' share of this catch limit. The subsequent hunt is managed under the WCA and the Marine Mammal Protection Act (MMPA), cooperatively by NMFS and the AEWC. NMFS's issuance of any future catch limits will be subject to IWC requirements, which will in turn be based on IWC Scientific Committee advice on the sustainability of any catch limits.

The purpose of this action is twofold: (1) to manage the conservation and sustainable subsistence utilization of the Western Arctic stock of bowhead whales (as required under the ICRW, the WCA, the MMPA, and other applicable laws), and (2) to fulfill the Federal Government's trust responsibility to recognize the cultural and subsistence needs of Alaska Natives.

The IWC conducted its most recent biennial meeting in September 2018 in Florianopolis, Brazil, and based on the management advice of the IWC Scientific Committee, extended the numerical aboriginal subsistence whaling catch limits for Western Arctic bowhead whales through 2025, and provided for increased flexibility in the conduct of the hunt and subsequent automatic renewal of these catch limits under specified circumstances. At the meeting, in a joint request, the four Aboriginal Subsistence Whaling (ASW) countries, the United States, St. Vincent and the Grenadines, Denmark on behalf of Greenland, and the Russian Federation, requested a one-time seven-year catch limit for bowhead whales, where the numeric limits would expire at the end of 2025 rather than at the end of 2024. In 2024, one year before the numeric catch limits will expire, the IWC will review those limits, and could extend them for an additional six years from 2026 through 2031. For additional information on the legal context and regulatory history of the proposed action, see **Section 1.1** and **Section 1.2**.

The proposed action continues implementation of the IWC subsistence catch limits that have been in effect since 1997. The IWC, NMFS, and the AEWC have cooperated in conserving and managing the subsistence harvest of bowhead whales for 40 years. The Western Arctic bowhead whale stock has been the subject of extensive and continued research by NMFS and the North Slope Borough (NSB) scientists, so a considerable body of knowledge has been developed. In general, relatively few public and agency comments were received during the scoping period, and public comment focused on adequate assessment of the Alternatives under the National Environmental Policy Act (NEPA). For a summary of the comments, see **Section 1.3**.

ES.2 Status of the Western Arctic Stock of Bowhead Whales

The bowhead whale is listed as “endangered” under the Endangered Species Act (ESA) and the western Arctic (also known as Bering-Chukchi-Beaufort) stock is designated as “depleted” under the MMPA. However, the stock has been increasing in recent years at an estimated rate of 3.7 percent annually. The most recent point estimate of abundance for 2011 is 16,820 animals and is between 73 and 162 percent of the estimated abundance prior to the onset of commercial whaling in the mid-nineteenth century, estimated at 10,400-23,000 animals. Although recent abundance estimates suggest population level that is as high or higher than the prior estimate of carrying capacity, the population growth rate shows no sign of slowing.

Additional information about the status of the bowhead whale, include abundance, trends, and genetics can be found in **Section 3.2**.

ES.3 Subsistence Hunting of Bowhead Whales

Most of the Western Arctic bowhead whales migrate annually from wintering areas in the northern Bering Sea, through the Chukchi Sea in the spring, and into the Beaufort Sea where they spend the summer. In the autumn, they return to the Bering Sea to overwinter. Eleven Alaskan Native coastal villages along this migratory route participate in traditional subsistence hunts of these whales: Gambell, Savoonga, Little Diomede, and Wales (on the Bering Sea coast); Kivalina, Point Hope, Point Lay, Wainwright, and Utqiaġvik (Barrow) (on the coast of the Chukchi Sea); and Nuiqsut and Kaktovik (on the coast of the Beaufort Sea).

The bowhead whale hunt constitutes an important subsistence activity for these communities, providing substantial quantities of food, as well as reinforcing the traditional skills and social structure of local Alaska Native culture. Such hunts have been regulated by a catch limit adopted by the IWC since 1977, with Alaska Native subsistence hunters from northern Alaskan communities taking less than one percent of the stock of bowhead whales per year.

Additional information on the cultural traditions of Alaska Native bowhead whaling is found in **Section 3.5**, while **Section 3.6** describes the co-management role of the AEWC.

ES.4 Alternatives

This Final Environmental Impact Statement (FEIS) is prepared pursuant to NEPA, (42 United States Code [U.S.C.] 4321 et seq.). Rather than the more limited review of an Environmental Assessment (EA), the fuller analysis of an EIS is provided here to provide greater transparency and opportunity for public review of NMFS's administration of the bowhead subsistence whaling program. The FEIS considers five alternatives for this proposed action, as described in detail in **Section 2**.

Under the ICRW Schedule provisions, the numeric limits on aboriginal subsistence whaling of bowhead whales consist of three components; strike quota limits, carryover or carry-forward provisions, and landed limits. Since 1997, the IWC aboriginal subsistence whaling regime has largely been based on a five-year term in which no more than 255 bowhead whales may be landed. Starting in 2013, the regime has continued through 2018 as six-year blocks over which no more than 336 bowhead whales may be landed. In addition to these landed limits, no more than 67 bowhead whales may be struck per year, with a provision for the annual addition of a carry-forward of up to 15 unused strikes from previous years, as detailed below Alternative 3. The term "strike quota" is used to refer to this limitation on the number of whales that may be struck, and the term "unused strike" refers to the unused portion of the limit on the number of whales that may be struck. Under some of the Alternatives listed below, these unused strikes may be "carried forward" into future years to accommodate for the variability in hunting conditions from one year to the next. The strike limit is larger than the landed limit, to take into account whales that may be struck but not successfully landed as a result of environmental conditions and other factors affecting hunting success in these remote villages.

For the four action alternatives, Alternative 2, Alternative 3, Alternative 4, and Alternative 5, bowhead subsistence whaling catch limits would be set annually by NMFS, subject to IWC requirements. In addition to receiving detailed monthly harvest reports from the AEWC, NMFS meets annually with the AEWC to review the stock status and results of the previous year's hunt. If it is determined that a hunt can proceed, NMFS issues the strike quota for the year. Further reporting requirements are also fulfilled in order to comply with IWC requirements, as described in **Section 3.6.4**.

The IWC adopted a one-time seven-year catch limit for bowhead whales at its 2018 meeting, so the numeric limits will expire at the end of 2025. In addition to the annual review provided in the Schedule, the IWC will review and update the numeric limits in 2024, one year before those limits expire. As such, the total number of bowhead whales that can be landed over that seven-year period would be increased by one-sixth from 336 to 392, and the total number of bowhead whales that could be landed over any 6-year period would remain unchanged at 336. Since the action Alternatives evaluate the impacts of a take of 336 whales over any six-year period, they account for the possibility of a one-time seven-year renewal. In addition, the IWC increased the carryover of unused strikes, and adopted an automatic renewal provision for sustainable status quo catch limits.

ES.4.1 Alternative 1 (No Action)

Do not grant the AEWC catch limits.

Under this alternative, NMFS would not grant the AEWC the U.S. portion of a subsistence whaling quota for cultural and nutritional purposes, notwithstanding the IWC Schedule's requirement to establish catch limits and permit aboriginal subsistence whaling for Western Arctic bowhead whales, subject to certain limitations. Increased catch limits would then become available for a bowhead hunt by Russian Chukotkan Natives, depending on their needs. This alternative would be contrary to the IWC Schedule, and because the WCA requires NMFS to implement requirements of the IWC Schedule, this alternative would also be contrary to the WCA.

ES.4.2 Alternative 2

Grant the AEWC an annual strike limit of 67 bowhead whales, not to exceed a total of 336 landed whales over any 6-year period, with no unused strikes from previous years added to the subsequent annual limit as carry-forward.

Under this alternative, NMFS would grant the AEWC the U.S. portion of an annual strike quota of 67 bowhead whales, not to exceed the U.S. portion of a total of 336 landed whales over any 6-year period. Under this alternative, no unused strikes from a previous year would be added to the strike quota for a subsequent year as carry-forward, notwithstanding the IWC's requirement to "carryover" or "carry forward" unused strikes in the bowhead subsistence catch limits. Because the IWC Schedule requires unused strikes to be carried forward and added to the strike quotas of subsequent years, subject to limits, this alternative would be contrary to the IWC Schedule. As the WCA requires NMFS to implement requirements of the IWC Schedule, this alternative would also be contrary to the WCA.

ES.4.3 Alternative 3

Grant the AEWC an annual strike limit of 67 bowhead whales, not to exceed a total of 336 landed whales over any 6-year period, with unused strikes from previous years carried

forward and added to the annual strike limit of subsequent years (subject to limits), provided that no more than 15 additional strikes are added to any one year's allocation of strikes. This alternative would maintain the status quo for any 6-year period with respect to management of the hunt.

Under this alternative, NMFS would grant the AEWC the U.S. portion of an annual strike quota of 67 bowhead whales (plus up to 15 unused strikes as carry-forward from previous years), not to exceed the U.S. portion of a total of 336 landed whales over any 6-year period. This alternative differs from Alternatives 1 and 2 by allowing the AEWC to carry forward unused strikes from previous years, and add up to 15 of those unused strikes per year to the catch limits for any subsequent years, consistent with the current IWC Schedule. Carry-over of unused strikes from previous years allows for variability in hunting conditions from one year to the next within limits that conserve the Western Arctic bowhead stock and is a long-standing feature of this quota structure.

ES.4.4 Alternative 4 (Preferred Alternative)

Grant the AEWC an annual strike limit of 67 bowhead whales, not to exceed a total of 336 landed whales over any 6-year period, with unused strikes from previous years carried forward and added to the annual strike quota of subsequent years (subject to limits), provided that no more than 50 percent of the annual strike limit is added for any one year. This alternative would maintain the status quo for any 6-year period with respect to management of the hunt for landed whales and employ the Commission's agreed-upon 50 percent carryover principle.

Under this alternative, NMFS would grant the AEWC the U.S. portion of an annual strike quota of 67 bowhead whales (plus up to 50 percent of the annual strike limit of unused strikes as carry-forward from previous years), not to exceed the U.S. portion of a total of 336 landed whales over any 6-year period. This alternative differs from Alternatives 1 and 2 by allowing the AEWC to carry forward unused strikes from previous years. This alternative differs from Alternative 3 by allowing the AEWC to carry forward unused strikes from previous years, provided that no more than 50 percent of the annual strike limit is added for any one year, consistent with the IWC's 50 percent carryover principle. A carry-forward allows for variability in hunting conditions from one year to the next within limits that conserve the Western Arctic bowhead stock and, as noted, is a long-standing feature of this quota structure.

ES.4.5 Alternative 5

Grant the AEWC an annual strike limit of 100 bowhead whales, not to exceed a total of 504 landed whales over any 6-year period, with unused strikes from previous years carried forward and added to the annual strike quota of subsequent years (subject to limits), provided that no more than 50 percent of the annual strike limit is added for any one year. This alternative would increase the harvest levels by 50 percent and employ the Commission's agreed-upon 50 percent carryover principle.

Under this Alternative, NMFS would authorize of a higher level of harvest, given: (1) the timeframe for NMFS's proposed action, i.e., from 2019 onward, where it is likely that the AEWC's subsistence need for bowhead whales will increase over this timeframe; and (2) the increasing size of the Western Arctic bowhead whale population. As with the other alternatives, NMFS's issuance of any future catch limits will be subject to IWC requirements, which, in turn, will be based on IWC Scientific Committee advice on the sustainability of those catch limits.

Under this alternative, NMFS would grant the AEWC the U.S. portion of an annual strike quota of 100 bowhead whales, not to exceed the U.S. portion of a total of 504 landed whales over any 6-year period. This alternative differs from Alternatives 1 through 4 by increasing the harvest levels by 50 percent, and differs from Alternatives 1 through 3 by employing the IWC's 50 percent carryover principle. A carry-forward allows for variability in hunting conditions from one year to the next within limits that conserve the Western Arctic bowhead stock and, as noted, is a long-standing feature of this quota structure.

ES.4.6 Preferred Alternative

The agency has identified Alternative 4 as its preferred alternative because it best meets the purpose and need of this action, and it achieves the socio-cultural benefits of the subsistence hunt at minimal environmental cost.

ES.5 Summary of Effects

In the sections that follow, the analysis of the biological effects of the alternatives on the Western Arctic bowhead whale stock focuses on the strike quota (i.e., 67 per year, with carry-forward in some alternatives), rather than the limit for landed whales, which was 336 for the six-year period 2013-2018. There are no definitive data on the fate of whales struck and not landed, also referred to as struck and lost whales. Some of the struck and lost whales are likely to die as a result of the strike. As a precautionary measure, the analysis here estimates maximum mortality, and thus assumes for analytic purposes that all whale strikes result in mortality. The effects analysis follows the methodology described in **Section 4.1**.

ES.5.1 Alternative 1 (No Action)

Do not grant the AEWC a quota.

Under this alternative, NMFS would not grant the AEWC the U.S. portion of a subsistence whaling quota for cultural and nutritional purposes, notwithstanding the IWC Schedule's requirement to establish catch limits and permit aboriginal subsistence whaling for Western Arctic bowhead whales, subject to certain limitations. Increased catch limits would then become available for a bowhead hunt by Russian Chukotkan Natives, depending on their needs. Therefore, the magnitude, extent, and duration/frequency of direct mortality under this alternative are considered negligible to the population of bowheads (using the method outlined in Table 4.1-1). Human activities associated with subsistence whaling would be sharply reduced under this alternative, so that the amount of noise and disturbance from subsistence whaling would also be considered negligible. Considered in light of the most recent population estimate of 16,820 whales (95 percent CI: 15,176 to 18,643) from 2011 (Givens et al. 2016), the current level of subsistence take represents 0.3 percent of the 2011 population, and likely an even smaller percentage of the current population, if continued annual population growth of 3.7 percent is assumed. This alternative would be contrary to the IWC Schedule, and because the WCA requires NMFS to implement requirements of the IWC Schedule, this alternative would also be contrary to the WCA.

ES.5.2 Alternative 2

Grant the AEWC an annual strike limit of 67 bowhead whales, not to exceed a total of 336 landed whales over any 6-year period, with no unused strikes from previous years added to the subsequent annual limit as carry-forward.

Alternative 2 would allow a maximum annual strike limit of up to 67 bowheads per year for a six-year period, subject to a maximum total of 336 landed whales over six years. Under this alternative, no unused strikes from a previous year would be added to the strike quota for a subsequent year as carry-forward, notwithstanding the IWC's requirement to "carryover" or "carry forward" unused strikes in the bowhead subsistence catch limits. Because the IWC Schedule requires unused strikes to be carried forward and added to the strike quotas of subsequent years, subject to limits, this alternative would be contrary to the IWC Schedule. Given the 2012 IWC Scientific Committee advice regarding the sustainability of this strike limit, the magnitude, geographic extent, and duration/frequency of this level of mortality are considered negligible for the bowhead population (**Table 4.1-1**) (IWC Scientific Committee Report, 2012).

Human activities associated with subsistence whaling under Alternative 2 would vary from year to year and place to place depending on whale movements, weather, ice characteristics, and social factors. Effects of human activities are localized and timed to coincide with the presence of whales during spring and autumn migrations. The effects due to subsistence whaling activities under Alternative 2 would be minor in magnitude, localized in geographic extent, and periodic and short-term in duration/frequency.

ES.5.3 Alternative 3

Grant the AEWC an annual strike limit of 67 bowhead whales, not to exceed a total of 336 landed whales over any 6-year period, with unused strikes from previous years carried forward and added to the annual strike limit of subsequent years (subject to limits), provided that no more than 15 additional strikes are added to any one year's allocation of strikes. This alternative would maintain the status quo for any 6-year period with respect to management of the hunt.

Under this alternative, NMFS would grant the AEWC the U.S. portion of an annual strike quota of 67 bowhead whales (plus up to 15 strikes as carry-forward), not to exceed the U.S. portion of a total of 336 landed whales over any 6-year period. The direct and indirect effects of Alternative 3 on the bowhead whale population would be nearly identical to Alternative 2 since the annual strike quota remains the same, but would allow for additional flexibility through the carry-forward of 15 unused strikes. Given the 2012 IWC Scientific Committee advice on the sustainability of this strike limit and carry-forward provisions, the magnitude, geographic extent, and duration/frequency of this level of mortality are considered negligible for the bowhead population. The effects of subsistence whaling activities under Alternative 3 would be minor in magnitude, localized in geographic extent, and periodic and short-term in duration/frequency, comparable to those identified under Alternative 2.

ES.5.4 Alternative 4 (Preferred Alternative)

Grant the AEWC an annual strike limit of 67 bowhead whales, not to exceed a total of 336 landed whales over any 6-year period, with unused strikes from previous years carried forward and added to the annual strike quota of subsequent years (subject to limits), provided that no more than 50 percent of the annual strike limit is added for any one year. This alternative would maintain the status quo for any 6-year period with respect to management of the hunt for landed whales and employ the Commission's agreed-upon 50 percent carryover principle.

Under this alternative, NMFS would grant the AEWC the U.S. portion of an annual strike quota of 67 bowhead whales (plus carry-forward), not to exceed the U.S. portion of a total of 336 landed whales over any 6-year period. Given the 2012 IWC Scientific Committee advice on the sustainability of this strike limit and carry-forward provisions, the magnitude, geographic extent, and duration/frequency of this level of mortality are considered negligible for the bowhead population. The effects of subsistence whaling activities under Alternative 4 would be minor in magnitude, localized in geographic extent, and periodic and short-term in duration/frequency. The disturbance effect would be considered minor at the population level, comparable to those identified under Alternatives 2 and 3.

ES.5.5 Alternative 5

Grant the AEWC an annual strike limit of 100 bowhead whales, not to exceed a total of 504 landed whales over any 6-year period, with unused strikes from previous years carried forward and added to the annual strike quota of subsequent years (subject to limits), provided that no more than 50 percent of the annual strike limit is added for any one year. This alternative would increase the harvest levels by 50 percent and employ the Commission's agreed-upon 50 percent carryover principle.

Under this alternative, NMFS would grant the AEWC the U.S. portion of an annual strike quota of 100 bowhead whales, with up to 50 unused strikes carried forward from previous years, not to exceed the U.S. portion of a total of 504 landed whales over any 6-year period. Though the Bowhead SLA for the level of take described in this Alternative has not been calculated, the impacts of that level of take, i.e., up to 150 whales per year, which includes the maximum carryover of unused strikes, on the Western Arctic stock of bowhead whales would likely be sustainable given that the maximum level of take for this Alternative would be less than 1 percent of the current population estimate of 16,820 animals. The population would still likely increase in numbers, albeit at a lower rate. As with the other alternatives, NMFS's issuance of any future catch limits will be subject to IWC requirements, which will in turn, be based on IWC Scientific Committee advice on the sustainability of those catch limits. NMFS assumes that the SLA would provide conservative management advice and meet IWC objectives for the management of stocks subject to aboriginal subsistence takes (cf. IWC, 1999).

While the Bowhead SLA has not been used to assess the harvest levels of Alternative 5, the Marine Mammal Protection Act (MMPA) concept of Potential Biological Removal (PBR) can be used to assess the impacts of a harvest of up to 150 bowheads per year, not to exceed a total of 504 landed whales over any six-year period. PBR is defined by the MMPA as the maximum number of animals, not including natural mortalities that may be removed from a marine mammal stock while allowing that stock to reach or maintain its optimum sustainable population.

The level of take in Alternative 5 would be below the 2016 PBR of 161 animals, and would have a minor impact.

In addition, the 2006 catch control rule Q indicates that a take below 155 whales per year would be considered to be a minor impact. Given that the Western Arctic bowhead whale abundance estimates have increased since the 2006 stock assessment, there is no reason to think that a current estimate of Q_{low} would be any lower today if a revised assessment were conducted.

Therefore, the effects of Alternative 5 on the bowhead whale population would be minor. The magnitude, geographic extent, and duration/frequency of this level of mortality are considered minor for the bowhead population. Effects of human activities are localized and timed to coincide with the presence of whales during spring and autumn migrations. The disturbance to the whales from subsistence whaling activities under Alternative 5 would be minor in magnitude, localized in geographic extent, and periodic, short-term in duration/frequency. The disturbance effect would be considered minor at the population level.

ES.5.6 Effects of the Alternatives on Individual Bowhead Whales

In addition to the effects of subsistence hunting (i.e., mortality for harvested whales and injury or mortality for whales struck and lost) on the Western Arctic bowhead whale stock, there are indirect effects of disturbance on individual bowhead whales that are not subject to the harvest. This includes the presence of vessels and underwater noise. These impacts would be negligible in magnitude, extent, and duration/frequency under Alternative 1, since under this Alternative no subsistence whaling would occur by Alaska Natives. Under Alternatives 2, 3, 4, and 5, subsistence whaling would occur with mortality and disturbance effects at the population level, as described in **Section 4.4**. Regarding disturbance effects to individual bowhead whales, the magnitude, extent, and duration of the associated disturbance effects would also be minor. For additional information on the effects of the alternatives on individual whales, see **Section 4.5**.

ES.5.7 Effects of the Alternatives on Other Wildlife

In the absence of bowhead whaling under Alternative 1, subsistence hunting would be redirected to other species, especially seals, walrus, and caribou, resulting in minor to moderate localized effects in terms of direct effects of mortality of these alternative subsistence resource species. For species that often congregate in numbers, like walrus and caribou, indirect effects of disturbance could affect numerous animals for each hunting event, and the effects would be considered moderate. Although this increased effort on other species is unlikely to replace the whale harvest, it could lead to moderate and possibly major reductions in the populations of other subsistence species. Alternatives 2, 3, 4 and 5 are not expected to have more than negligible or minor effects on other wildlife species. Just as individual whales may be indirectly affected by hunting activities, (e.g., vessel noise) (**Section 4.5**), other wildlife such as seals or polar bears may also be disturbed by these activities. Moreover, the Native villages and communities that currently harvest bowhead whales would be likely to alter their harvest patterns of other subsistence foods depending on the number of bowhead whales harvested.

NMFS completed a consultation under section 7 of the ESA regarding the potential effects of the bowhead subsistence harvests on ESA listed species and designated critical habitat under NMFS jurisdiction. In its November 2018 biological opinion, NMFS reviewed potential impacts to seven species: bowhead whale; North Pacific right whale; fin whale; humpback whale, Western North Pacific Distinct Population Segment (DPS); humpback whale, Mexico DPS; bearded seal; and ringed seal (see **Appendix 8.4.2**). NMFS concluded that the proposed action is not likely to jeopardize the continued existence of bowhead whales or North Pacific right whales. NMFS does not expect any effects to designated North Pacific right whale critical habitat, which is located far outside the action area. While the Arctic ringed seal, Beringia DPS bearded seal, Mexico DPS humpback whale, Western North Pacific DPS humpback whale, and fin whale are expected to occur in the action area, NMFS concluded that they are unlikely to be adversely affected by the proposed action.

The U.S. Fish and Wildlife Service (USFWS) was consulted regarding potential effects of the bowhead subsistence harvests on ESA listed species, ESA candidate species, and designated critical habitat under USFWS jurisdiction. In its May 2018 consultation letter, USFWS reviewed potential impacts to three species listed as threatened: Steller's eider, spectacled eider, and polar bear (see **Appendix 8.4.1**). Potential impacts to designated critical habitat for polar bear and spectacled eider were also reviewed. USFWS concluded that the proposed annual quotas for bowhead subsistence harvests are unlikely to adversely affect listed species or designated critical habitat under USFWS's jurisdiction. For additional information see **Section 4.7**.

ES.5.8 Socio-cultural Effects of the Alternatives

Alternative 1 would result in major adverse impacts to the communities that rely heavily on subsistence hunts of bowheads for nutritional and cultural sustenance. This alternative would raise environmental justice concerns, since it would result in disproportionate adverse impacts to the predominantly minority and low-income populations of the AEWC member communities. Alternative 1 would also likely be viewed as a failure on the part of NMFS to exercise its trust responsibility with respect to Alaska Natives and, possibly, to Native Americans in general. Alternatives 2, 3, 4, and 5, would provide for continuation of subsistence bowhead whaling, with many beneficial effects of major magnitude, extent, and duration. For further information, see **Section 4.8**.

ES.5.9 Cumulative Effects of the Alternatives

This FEIS analyzes the cumulative effects of the alternatives when taken together with impacts from other activities and phenomena, such as oil exploration and climate change. The analysis of cumulative effects on the Western Arctic bowhead whale stock, found in **Section 4.6**, concludes that none of the action alternatives, when other activities and ongoing mitigation measures are taken into consideration, would result in major adverse impacts on the bowhead whale population.

As shown in **Section 4.7**, none of the alternatives, other than possibly Alternative 1, when combined with other reasonably foreseeable activities, would result in major adverse effects on other wildlife species. As for socio-cultural effects, only Alternative 1 (No Action) would result in major adverse effects, and this holds true when the cumulative effects of other activities considered (**Section 4.8**).

However, it is important to note that a Very Large Oil Spill (VLOS) could have major adverse effects, in terms of magnitude, duration/frequency, and geographic extent. The duration of effects could range from temporary (such as skin irritations or short-term displacement) to permanent (e.g., endocrine impairment or reduced reproduction) and would depend on the length and means of exposure, such as how and how much oil was ingested. Displacement of bowheads from areas impacted by the spill due to the presence of oil and increased vessel activity would be likely. If the area is an important bowhead feeding area (such as off Barrow or Camden Bay) or along the migratory corridor, the magnitude of the effects could be major. The extent of the impact of a VLOS on bowhead whales could be widespread, given the migratory nature of bowhead whales.

The following tables reproduced from **Section 4** of this FEIS summarize the direct, indirect, and cumulative effects under each alternative for all resources where environmental consequences were evaluated.

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Table ES-1

Bowhead Whale Subsistence Harvest EIS Effects at a Glance

Type of Effect	Alternative 1 Do not grant AEWC a catch limit.	Alternative 2 Annual strike quota of 67 bowhead whales.	Alternative 3 Annual strike quota of 67 bowhead whales, plus up to 15 previously unused strikes as carry-forward.	Alternative 4 Annual strike quota of 67 bowhead whales, plus up to 33 (50% of annual strike quota) previously unused strikes as carry-forward.	Alternative 5 Annual strike quota of 100 bowhead whales, plus up to 50 (50% of annual strike quota) previously unused strikes as carry-forward.
Direct and Indirect Effects on Bowhead Whale Population - Mortality	No Impact	Negligible	Negligible	Negligible	Minor Adverse
Direct and Indirect Effects on Bowhead Whale Population - Disturbance	No Impact	Minor Adverse	Minor Adverse	Minor Adverse	Minor Adverse
Direct and Indirect Effects on Individual Bowhead Whales	No Impact	Disturbance - Minor Adverse	Disturbance - Minor Adverse	Disturbance - Minor Adverse	Disturbance – Minor Adverse
Cumulative Effects on Bowhead Whale Stock	Mortality – Negligible Disturbance - Minor Adverse Very Large Oil Spill - Low probability, Major Adverse	Mortality – Negligible Disturbance - Minor Adverse Very Large Oil Spill - Low probability, Major Adverse	Mortality – Negligible Disturbance - Minor Adverse Very Large Oil Spill - Low probability, Major Adverse	Mortality – Negligible Disturbance - Minor Adverse Very Large Oil Spill - Low probability, Major Adverse	Mortality – Negligible Disturbance – Minor Adverse Very Large Oil Spill - Low probability, Major Adverse
Effects on Other Wildlife	Minor Adverse to Moderate Adverse	Negligible to Minor Adverse	Negligible to Minor Adverse	Negligible to Minor Adverse	Negligible to Minor Adverse

Effects on Subsistence Patterns	Major Adverse	Major Beneficial	Major Beneficial	Major Beneficial	Major Beneficial
Effects on Health	Major Adverse	Major Beneficial	Major Beneficial	Major Beneficial	Major Beneficial
Effects on Public Safety	Minor Beneficial	Minor Adverse	Minor Adverse	Minor Adverse	Minor Adverse
Effects on Other Tribes	Moderate Adverse to Major Adverse	Negligible	Negligible	Negligible	Negligible
Effects on the General Public	Anti-whaling Public - Moderate Beneficial Pro-indigenous Rights Public - Moderate Adverse	Anti-whaling Public - Minor Adverse Pro-indigenous Rights Public - Minor Beneficial	Anti-whaling Public - Minor Adverse Pro-indigenous Rights Public - Minor Beneficial	Anti-whaling Public - Minor Adverse Pro-indigenous Rights Public - Minor Beneficial	Anti-whaling Public - Minor to Moderate Adverse Pro-indigenous Rights Public - Minor Beneficial
Effects on Environmental Justice	Major Disproportionate Adverse Effects	No Disproportionate Adverse Effects	No Disproportionate Adverse Effects	No Disproportionate Adverse Effects	No Disproportionate Adverse Effects

Key:

Adverse ←			**Neutral**		→	**Beneficial**
Major Disproportionate Adverse Effects	Moderate	Minor	Negligible	Minor	Moderate	Major No Disproportionate Adverse Effects

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Table ES-2
Summary of Direct, Indirect, and Cumulative Effects of the Alternatives and Other Activities in the Project Area on Bowhead Whales

Effect		Alternative 1 Do not grant AEWC a catch limit.	Alternative 2 Annual strike quota of 67 bowhead whales.	Alternative 3 Annual strike quota of 67 bowhead whales, plus up to 15 previously unused strikes as carry-forward.	Alternative 4 Annual strike quota of 67 bowhead whales, plus up to 33 (50% of annual strike quota) previously unused strikes as carry-forward.	Alternative 5 Annual strike quota of 100 bowhead whales, plus up to 50 (50% of annual strike quota) previously unused strikes as carry-forward.
Direct and Indirect Effects	**Mortality**	No direct or indirect effects of Alternative, as the Alternative would not contribute to mortality.	Negligible effects on mortality of Western Arctic bowhead whale population.	Same as Alternative 2.	Same as Alternative 2.	Minor adverse effects on mortality of Western Arctic bowhead whale population.
	Disturbance	No direct or indirect effects of Alternative, as the Alternative would not contribute to disturbance.	Minor effects of disturbance in magnitude, extent, and duration/frequency.	Same as Alternative 2.	Same as Alternative 2.	Same as Alternative 2.
Cumulative Effects		Cumulative effects to mortality would be negligible in magnitude, extent, and duration/frequency.	Cumulative effects due to mortality would be negligible in magnitude, extent, and duration/frequency. Cumulative effects to	Same as Alternative 2.	Same as Alternative 2.	Same as Alternative 2.

	Cumulative effects to disturbance would be negligible in magnitude, extent, and duration/frequency. A VLOS could have major adverse effects in terms of magnitude, extent, and duration/frequency if the spill occurred during a time when bowheads were present.	disturbance would be moderate in magnitude, extent, and duration/frequency. A VLOS could have major adverse effects in terms of magnitude, extent, and frequency if the spill occurred during a time when bowheads were present.			

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Table ES-3
Summary of Direct, Indirect, and Cumulative Effects of the Alternatives and Other Activities in the Project Area on Other Wildlife

Effect		Alternative 1 **Do not grant AEWC a catch limit.**	Alternative 2 **Annual strike quota of 67 bowhead whales.**	Alternative 3 **Annual strike quota of 67 bowhead whales, plus up to 15 previously unused strikes as carry-forward.**	Alternative 4 **Annual strike quota of 67 bowhead whales, plus up to 33 (50% of annual strike quota) previously unused strikes as carry-forward.**	Alternative 5 **Annual strike quota of 100 bowhead whales, plus up to 50 (50% of annual strike quota) previously unused strikes as carry-forward.**
Direct and Indirect Effects	**Mortality**	Minor to moderate effects in magnitude, extent, and duration/frequency.	Negligible to minor direct and indirect effects on mortality.	Same as Alternative 2.	Same as Alternative 2.	Same as Alternative 2.
	Disturbance	Minor to moderate effects in magnitude, extent, and duration/frequency.	Negligible to minor direct and indirect effects on disturbance.	Same as Alternative 2.	Same as Alternative 2.	Same as Alternative 2.
Cumulative Effects		Cumulative effects would be moderate for important game species (e.g. caribou) and minor for other species.	Negligible cumulative effects.	Same as Alternative 2.	Same as Alternative 2.	Same as Alternative 2.

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Table ES-4
Summary of Direct, Indirect, and Cumulative Effects of the Alternatives and Other Activities in the Project Area on the Sociocultural Environment

Effect		Alternative 1 Do not grant AEWC a catch limit.	Alternative 2 Annual strike quota of 67 bowhead whales.	Alternative 3 Annual strike quota of 67 bowhead whales, plus up to 15 previously unused strikes as carry-forward.	Alternative 4 Annual strike quota of 67 bowhead whales, plus up to 33 (50% of annual strike quota) previously unused strikes as carry-forward.	Alternative 5 Annual strike quota of 100 bowhead whales, plus up to 50 (50% of annual strike quota) previously unused strikes as carry-forward.
Direct and Indirect Effects	**Subsistence**	Adverse effects and major in magnitude, extent, and duration/frequency.	Beneficial effects and major in magnitude, extent, and duration/frequency.	Same as Alternative 2.	Same as Alternative 2.	Same as Alternative 2.
	Public Health and Safety	Adverse effects and major in magnitude, extent, but unknown duration/frequency. The effects on safety are complex, with positive net effects to hunter safety that count be countervailed by adverse nutritional, psychological, and	Beneficial effects that are major for public health, but effects on safety would be adverse and minor due to the inherent risks of whaling.	Substantially similar to Alternative 2, but with additional temporal flexibility as a result of carry-forward that would increase the beneficial effects to public safety.	Substantially similar to Alternative 2, but with additional temporal flexibility as a result of carry-forward that would increase the beneficial effects to public safety.	Substantially similar to Alternative 2, but with additional temporal flexibility as a result of additional strikes and carry-forward that would increase the beneficial effects to public safety.

		social consequences.				
Cumulative Effects		Cumulative effects on subsistence practices, nutrition, and health would be adverse and major in magnitude, extent, and duration. Cumulative effects on public safety are unknown.	The contribution of Alternative 2 to the cumulative effects on subsistence harvest practices would be beneficial and major in magnitude, extent, and duration. Cumulative effects on subsistence harvest practices would be adverse and minor to moderate, depending on the timing and location of oil and gas activities, and the efficacy of measure intended to mitigate impacts. In the case of a VLOS, the cumulative effects on subsistence practices could be major in magnitude, extent, and duration,	Same as Alternative 2.	Same as Alternative 2.	Same as Alternative 2.

		and could countervail any beneficial effects.			

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1.0 PURPOSE AND NEED

1.1 Introduction

1.1.1 Summary of the Proposed Action

The National Oceanic and Atmospheric Administration's (NOAA) National Marine Fisheries Service (NMFS) proposes to issue annual catch limits to the Alaska Eskimo Whaling Commission (AEWC) to allow continuation of its subsistence hunt for bowhead whales from the Western Arctic stock[1] from 2019 onward, subject to catch limits set by the International Whaling Commission (IWC or Commission)[2]. In turn, IWC-set catch limits are based on IWC Scientific Committee advice on the sustainability of proposed catch limits using a population model, referred to as a "Strike Limit Algorithm" (SLA). The SLA used by the IWC is specific to this population of bowhead whales and is the IWC's formula for calculating sustainable aboriginal subsistence whaling removal levels, based on the size and productivity of a whale population, in order to satisfy subsistence need. The purpose of NMFS's proposed action is to fulfill its federal trust responsibilities by recognizing the nutritional and cultural needs of Alaska Natives, to meet the international obligations of the United States, and to ensure that any aboriginal subsistence hunt of whales does not adversely affect the conservation of the Western Arctic bowhead whale stock.

This Environmental Impact Statement (EIS), prepared pursuant to the National Environmental Policy Act (NEPA, 42 U.S.C. 4321 *et seq*.), considers five alternatives for issuing the AEWC catch limits for bowhead whales pursuant to the International Convention for the Regulation of Whaling (ICRW) (including its Schedule), which established the IWC. The proposed action would comply with NMFS's responsibilities under the Whaling Convention Act (WCA) and under Section 101(b) of the Marine Mammal Protection Act (MMPA).

1.1.2 Location of Action

The project area encompasses U.S. waters within the geographic range of the Western Arctic bowhead stock. The users of the bowhead resource affected by the proposed action are the residents of Alaska villages currently participating in subsistence hunts of Western Arctic bowhead whales. These include Gambell, Savoonga, Little Diomede, and Wales (located along

[1] Also referred to as the Bering-Chukchi-Beaufort seas stock and the Bering Sea stock.

[2] At IWC67 in 2018, the IWC extended the numerical aboriginal subsistence whaling catch limits for Western Arctic bowhead whales through 2025, and provided for increased flexibility in the conduct of the hunt and subsequent automatic renewal of these catch limits under specified circumstances. NMFS's issuance of catch limits for 2019 and beyond would be subject to applicable IWC catch limits in effect at the time.

the coast of the Bering Sea); Kivalina, Point Hope, Point Lay, Wainwright and Utqiaġvik (Barrow) (along the coast of the Chukchi Sea); and Nuiqsut and Kaktovik (on the coast of the Beaufort Sea). The IWC-adopted catch limit is also shared with Russian subsistence hunters in villages along the Chukotka Peninsula (**Figure 1.1.2-1**).

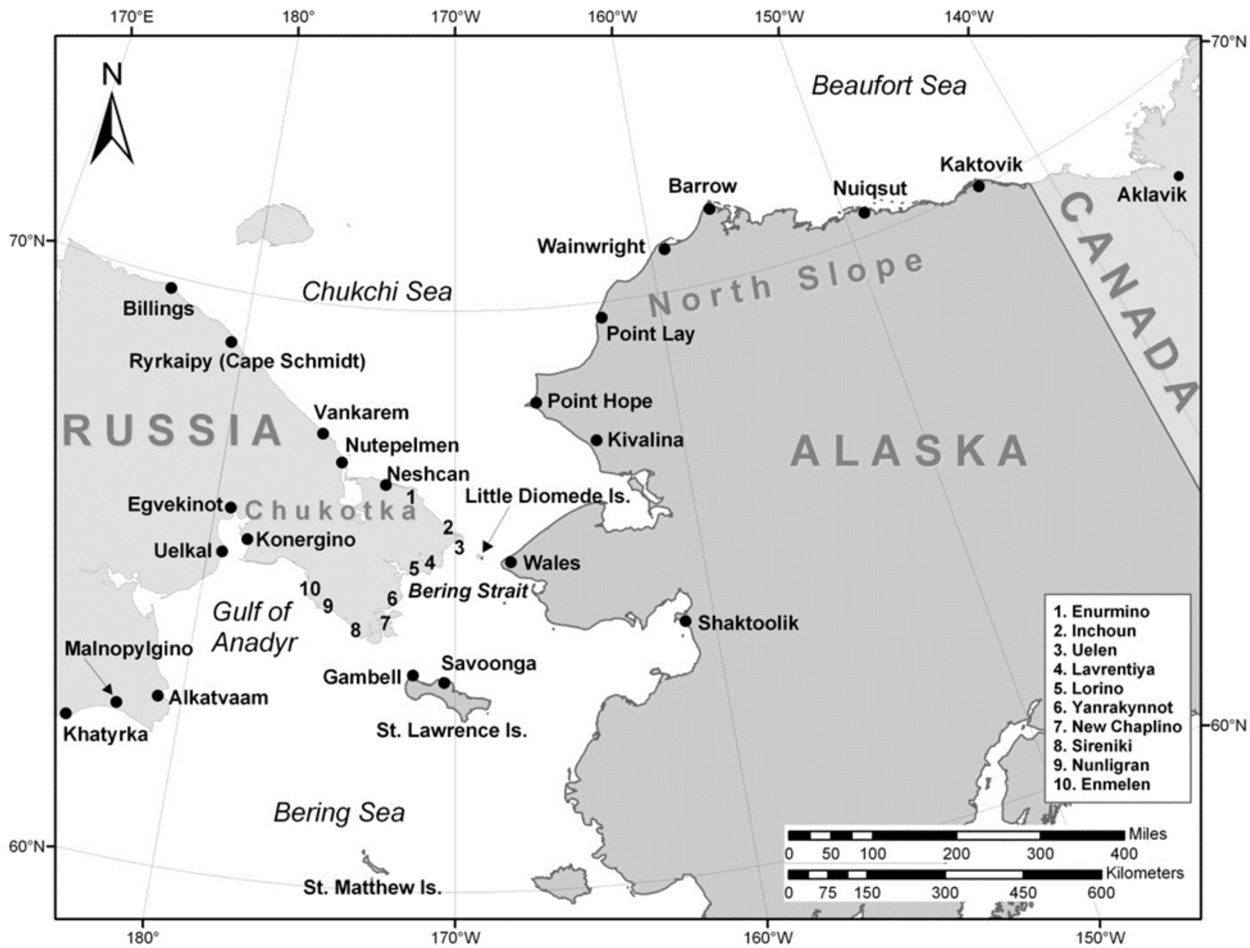

Figure 1.1.2-1. Historic and Current Bowhead Whaling Villages in Alaska, Canada, and the Russian Federation.

1.1.3 Summary of Western Arctic Bowhead Whale Status

The current understanding is that the majority of the Western Arctic bowhead whale population migrates annually from wintering areas in the northern Bering Sea, through the Chukchi Sea in the spring (March through June), to the Beaufort Sea where they spend much of the summer (mid-May through September). In the autumn (September through November), they return via the Beaufort and Chukchi seas to the Bering Sea to overwinter (November through March) (Braham *et al*., 1980; Moore and Reeves, 1993). Because the bowhead whale species is listed as "endangered" under the Endangered Species Act (ESA), the Western Arctic population is classified as a strategic stock under the MMPA and therefore also designated as "depleted" under the MMPA.

The Western Arctic bowhead whale population has been increasing in recent years at an estimated rate of increase of 3.7 percent (Givens *et al*., 2016). At its 2018 meeting, the IWC Scientific Committee noted that there are now two independent estimates of abundance for this stock in 2011 (2018 IWC Scientific Committee Report at 21). The Scientific Committee stated that a new abundance estimate has been accepted for the year 2011 from a long-term photo-identification capture-recapture study and agreed that this new estimate is suitable for providing management advice and for use in the SLA. The photo-identification capture-recapture study estimates the population level at 27,133 animals, with a 95 percent confidence interval of between 17,809 to 41,337 animals (2018 IWC Scientific Committee Report at 18). The IWC Scientific Committee also stated that the previously accepted, completely independent, 2011 abundance estimate from an ice-based survey conducted near Point Barrow, Alaska (Givens *et al*., 2016) is also acceptable for use in the SLA and has been used in that regard. The ice-based survey estimates the population level at 16,820 animals, with a 95 percent confidence interval of 15,176 to 18,643. This estimated population level is between 73 percent and 161 percent of the pre-exploitation abundance estimated at 10,400-23,000 animals by Woodby and Botkin (1993). Some analyses suggest the population may be approaching carrying capacity (K) though there is no sign of slowing in the population growth rate (Brandon and Wade, 2006).

The estimated annual mortality rate incidental to commercial fisheries (0.2 whales per year) is not known to exceed 10 percent of the Potential Biological Removal (PBR) for the stock. Potential Biological Removal (PBR) is defined by the MMPA as the maximum number of animals, not including natural mortalities that may be removed from a marine mammal stock while allowing that stock to reach or maintain its optimum sustainable population. It is the product of the minimum population estimate of the stock; one-half the maximum theoretical or estimated net productivity rate of the stock at a small population size; and a recovery factor of between 0.1 and 1.0. The PBR for bowhead whales of the Western Arctic stock is 161 individuals annually (NMFS, 2016). Criteria developed for recovery of large whales in general (Angliss *et al*., 2002) and bowhead whales in particular (Shelden *et al*., 2001) will be considered in the next ESA status review. PBR was developed as a measure of the impact of total human-caused mortality, and under the MMPA, has direct management implications for commercial fisheries bycatch. However, PBR is not the metric used by the IWC to evaluate the effects of subsistence whaling. As described more fully in **Section 3.2.1**, below, in 2002 the IWC adopted the SLA for Western Arctic bowhead whales (IWC, 2003a, b), to calculate appropriate levels for the strike limit that would achieve IWC management goals, including stock conservation, in a very wide range of scenarios.

On February 22, 2000, NMFS received a petition from the Center for Biological Diversity and Marine Biodiversity Protection Center to designate critical habitat for the Western Arctic bowhead stock under the ESA. Petitioners asserted that the nearshore areas from the U.S.-Canada border to Barrow (now Utqiaġvik), Alaska should be considered critical habitat. On May 22, 2001, NMFS found the petition to have merit and initiated a formal review (66 FR 28141). On August 30, 2002 (67 FR 55767), NMFS announced its decision to not designate critical habitat for this population. NMFS decided not to designate critical habitat because: (1) the decline and reason for listing the species was over exploitation by commercial whaling, and habitat issues were not a factor in the decline; (2) there was no indication that habitat degradation is having any negative impact on the increasing population; (3) the population is abundant and increasing; and (4) existing laws and practices adequately protect the species and its habitat (67 FR at 55767).

1.1.4 Alaska Native Tradition of Subsistence Hunt of Bowhead Whales

Iñupiat and Siberian Yupik Alaska Natives have hunted bowhead whales for over 2,000 years (Stoker and Krupnik, 1993). Hunting bowhead whales in Alaska remains a communal activity that supplies highly valued meat and *maktak*[3] for the entire community, as well as for sharing with persons in locations other than the local community with whom local residents share familial, social, cultural, or economic ties (see Kofinas G. *et al*., 2016 for a discussion of sharing networks). Formalized patterns of hunting, sharing, and consumption characterize the modern bowhead harvest. In addition, whaling captains are highly respected for their traditional knowledge of ice, weather, and whale behavior, which is necessary to hunt successfully, for their generosity in supporting their whaling crews, communities, and others in need; and for their stewardship of traditions of sharing and distributing meat and *maktak*. Of all subsistence activities in these communities, the bowhead whale hunt represents one of the greatest concentrations of community-wide effort and time. It is highly productive, accounting for a substantial percentage of the food consumed in the AEWC communities, and is shared with relatives in other Alaskan communities, as well as with other Native subsistence communities throughout northern Alaska. As the principal activity through which traditional skills for survival in the Arctic are passed to younger generations, the bowhead hunt provides ongoing reinforcement of the traditional social structure. Thus, the bowhead subsistence hunt is a large part of the cultural tradition of these communities and their modern cultural identity (Worl, 1979; Braund *et al*., 1997; Kofinas G. *et al*., 2016).

Subsistence whaling has been regulated by a catch limit under the authority of the IWC since 1977. Alaska Native subsistence hunters from northern Alaskan communities (see **Figure 1.1.2-1**) take less than 1 percent of the stock of bowhead whales per year (Philo *et al*., 1993). After

[3] *Maktak* is whale skin and a layer of blubber that is used for food.

1977, the number of whales landed ranged between 8 and 55 per year and the number of whales struck and lost ranged from 5 to 28 per year (AEWC and NSB, 2010). The efficiency of the hunt has increased since 1977, due to a number of factors discussed further in **Section 3.5**. The lower landed numbers are from the early years of the bowhead subsistence quota at the IWC.

1.2 Legal Framework

The following section describes the legal framework that will guide agency decisions related to this project, including federal trust responsibility, governance of aboriginal subsistence whaling catch limits under the ICRW and WCA, species protection and conservation under the MMPA and ESA, and environmental review under NEPA.

1.2.1 Federal Trust Responsibility

NMFS, as an agent of the federal government, has a trust responsibility to Indian tribes. The concept of "trust responsibility" is derived from the special relationship between the federal government and Indians. Based upon provisions of the U.S. Constitution authorizing Congress to regulate commerce "among the several states, and with the Indian Tribes" (U.S. Constitution, Article I, Section 8, clause 3), the trust responsibility was first delineated by Supreme Court Chief Justice John Marshall in *Cherokee Nation v. Georgia*, 30 U.S. 1 (5 Pet.) (1831). Later, in *Seminole Nation v. United States*, 316 U.S. 286 (1942), the Court noted that the United States has charged itself with moral obligations of the highest responsibility and trust toward Indian tribes. The scope of the federal trust relationship is broad and incumbent upon all federal agencies. The U.S. government has an obligation to protect tribal land, assets, and resources as well as a duty to carry out the mandates of federal law with respect to American Indian and Alaska Native tribes. This unique relationship and its foundation in the Constitution provide the basis for legislation, treaties, and Executive Orders (EO) that grant unique rights or privileges to Native Americans (*Morton v. Mancari*, 417 U.S. 535, 551-53 (1974)).

In furtherance of this trust responsibility and to demonstrate respect for sovereign tribal governments, the principles described above were incorporated into Secretarial Order No. 3206, dated June 5, 1997, and signed by the Secretaries of Commerce and Interior. This Order, entitled "American Indian Tribal Rights, Federal-Tribal Trust Responsibilities, and the Endangered Species Act," directs both departments to carry out their responsibilities under the ESA in a manner that brings into accord the federal trust responsibility to tribes, tribal sovereignty, and statutory missions of the departments to avoid or minimize the potential for conflict and confrontation. However, this Secretarial Order did not extend to Alaska Natives; and hence, on January 19, 2001, the Secretary of Commerce and the Secretary of the Interior signed Secretarial Order No. 3225, entitled "Endangered Species Act and Subsistence Uses in Alaska" (Supplement to Secretarial Order 3206), to extend to Alaska Natives the principles articulated in Order No. 3206.

On May 14, 1994, EO 13084 was issued, requiring each federal agency to establish meaningful consultation and collaboration with Indian tribal governments (including Alaska Natives) in formulating policies that significantly or uniquely affect their communities. Entitled "Consultation and Coordination with Indian Tribal Governments," the order requires agency policymaking to be guided by principles of respect for tribal treaty rights and responsibilities that arise from the unique legal relationship between the federal government and the Indian tribal governments. Furthermore, on issues relating to treaty rights, EO 13084 directs each agency to explore and, where appropriate, use consensual mechanisms for developing regulations.

On November 6, 2000, EO 13175 replaced EO 13084. The order carries the same title and undertakings as the previous order about the government-to-government relationship between the U.S. government and Indian tribes. EO 13175 requires that all executive departments and agencies consult with Indian tribes and respect tribal sovereignty in developing policy on issues that affect Indian communities.

1.2.2 International Convention for the Regulation of Whaling

The International Convention for the Regulation of Whaling (ICRW) is an international treaty signed on December 2, 1946, to "provide for the proper conservation of whale stocks and thus make possible the orderly development of the whaling industry" (ICRW, December 2, 1946, 161 United Nations Treaty Series 72). The United States was an original signatory to the ICRW in 1946, and the treaty was ratified by the U.S. Senate and entered into force for the United States in 1948 (62 Stat. 1716). A main focus of the ICRW was the establishment of the International Whaling Commission (IWC or Commission). The IWC is an international organization, administered by a Secretary and staff. IWC membership consists of one commissioner from each Contracting Government (i.e., government of a nation that signed the ICRW). Under Article V.1 of the ICRW, the IWC's charge is to adopt regulations with respect to the conservation and utilization of whale resources by periodically amending the provisions of the Schedule, a document that Article I.1 makes an integral part of the ICRW. IWC regulations adopted in the Schedule may establish protected and unprotected species; open and close seasons and waters; implement size limits, time, method, and intensity of whaling; and specify gear, methods of measurement, catch returns, and other statistical and biological records, and methods of inspection for whale stocks (Article V.1). The IWC seeks to reach its decisions by consensus. Voting procedures apply when consensus is not possible.

According to Article III.2 of the ICRW and IWC the Rules of Procedure, to amend the Schedule and adopt whaling regulations requires a three-fourths majority of all who voted yes or no (each

Contracting Government has one vote). Article V.2 of the ICRW specifies that amendments to the Schedule shall meet the following criteria:

a) Be necessary to carry out the objectives and purposes of the ICRW and provide for the conservation, development, and optimum utilization of whale resources;

b) Be based on scientific findings;

c) Not involve restrictions on the number or nationality of factory ships or land stations, nor allocate specific quotas to any factory ship(s) or land station(s); and

d) Take into consideration the interests of the consumers of whale products and the whaling industry.

The IWC established a Scientific Committee— consisting of approximately 200 of the world's leading whale biologists— to provide advice on the status of whale stocks, in part, to inform the development of IWC whaling regulations. The Scientific Committee considers particular subject matter based on the scientific needs of the IWC. These needs are broadly expressed in the ICRW text, which directs the IWC to "encourage, recommend, or, if necessary, organize studies and investigations relating to whales and whaling; collect and analyze statistical information concerning the current condition and trend of the whale stocks and the effects of whaling activities thereon; and study, appraise, and disseminate information concerning methods of maintaining and increasing the populations of whale stocks" (Article IV.1).

The IWC recognizes a distinction between whaling for commercial purposes and whaling by aborigines for subsistence purposes. The ICRW and its predecessor treaties were negotiated to regulate commercial whaling and protect whale stocks endangered by commercial activity. In this context, provisions to allow aboriginal subsistence whaling to continue when commercial whaling was prohibited on specific whale stocks were included in the predecessor treaties and the original 1946 IWC Schedule (note that ‘aborigines’ and ‘aboriginal’ refers to indigenous groups for purposes of this EIS). In the case of bowhead whales, these provisions did not impose catch limits on aboriginal subsistence whaling. It was not until the mid-1970s, when the IWC became concerned about the status of the Western Arctic stock because of a lack of western scientific data (a concern later research showed to be unfounded), that the IWC sought to restrict aboriginal subsistence hunting on bowheads, first by briefly eliminating from the Schedule the provision that allowed subsistence hunting of bowheads in 1977, and then by adopting numeric limits on strikes and landings for 1978 and beyond. Then, in the context of preparing to adopt a global moratorium on commercial whaling, the IWC consolidated several different Schedule provisions applicable to aboriginal subsistence whaling on different stocks into a comprehensive aboriginal subsistence scheme that was placed in paragraph 13 of the Schedule.

Today, the IWC governs aboriginal whaling internationally by specifically identifying stocks subject to aboriginal subsistence whaling, establishing principles governing such whaling, and, since 1982, by requiring that overall catch limits be set for such whaling on such stocks. To initiate the process, Contracting Governments acting on behalf of aborigines in their respective nations make a proposal to the IWC based on cultural and nutritional needs[4]. At the 1994 meeting, the IWC adopted Resolution 1994-4 to reaffirm the following three broad objectives as general guidelines for evaluating such proposals from Contracting Governments:

(1) To ensure that the risks of extinction to individual stocks are not seriously increased by subsistence whaling;

(2) To enable aboriginal people to harvest whales in perpetuity at levels appropriate to their cultural and nutritional requirements, subject to the other objectives; and

(3) To maintain the status of whale stocks at or above the level giving the highest net recruitment and to ensure that stocks below that level are moved towards it, so far as the environment permits.

If the IWC agrees with the Contracting Government submission on need, then the IWC amends the Schedule to expressly permit aboriginal subsistence whaling on the requested stock. Since 1977, the IWC has set catch limits for aboriginal subsistence whaling, subject to annual (and now biennial) review by the Commission, based on advice of the Scientific Committee. These catch limits are contained in paragraph 13 of the Schedule, and include numeric and non-numeric limits. Non-numeric catch limits include a prohibition on the striking, taking or killing of calves or any whale accompanied by a calf. Numeric catch limits for Western Arctic bowhead whales have been expressed in three components: (1) a limit on the number of whales landed; (2) a slightly higher limit on the number of whales that may be struck, and (3) carryover or carry-forward provisions for unused strikes. The term “strike quota” is often used to refer to this limitation on the number of whales that may be struck. This approach takes into account the fact that not all whales struck are landed, due in large part to the conditions under which the harvests occur, and ensures an upper limit on total whale mortality for conservation management. The Whaling Convention Act (WCA) defines aboriginal subsistence whaling as whaling authorized by paragraph 13 of the Schedule annexed to and constituting a part of the ICRW (50 CFR 230.2). Aboriginal subsistence whaling is not otherwise defined in the Schedule; however, the IWC

[4] At IWC66 in 2016, the Commission stated, “Contracting Governments concerned will continue to submit information in support of proposed catch and strike limits for [Aboriginal Subsistence Whaling] to satisfy aboriginal subsistence needs (2016 IWC Chair’s Report at 17). At IWC67 in 2018, the Commission adopted a timeline and process for review of Aboriginal Subsistence Whaling catch/strike limits that incorporates this 2016 direction from the Commission. See 2018 Aboriginal Subsistence Whaling Working Group Report, IWC/67/ASW/Rep/01 Annex E.

adopted the following definition of aboriginal "subsistence use" by consensus at its 2004 meeting (2004 IWC Chair's Report at 15):

(1) The personal consumption of whale products for food, fuel, shelter, clothing, tools, or transportation by participants in the whale harvest.

(2) The barter, trade, or sharing of whale products in their harvested form with relatives of the participants in the harvest, with others in the local community or with persons in locations other than the local community with whom local residents share familial, social, cultural, or economic ties. A generalized currency is involved in this barter and trade, but the predominant portion of the products from such whales are ordinarily directly consumed or utilized in their harvested form within the local community.

(3) The making and selling of handicraft articles from whale products, when the whale is harvested for the purposes defined in (1) and (2) above.

General principles governing aboriginal subsistence whaling are contained in paragraph 13(a) of the Schedule, including a formula for calculating catch limits, and catch limits for specific years are contained in paragraph 13(b) of the Schedule.

Paragraph 13(a) provides, in part, that catch limits for aboriginal subsistence whaling to satisfy aboriginal subsistence need "shall be established" according to certain management principles. Paragraph 13(a) of the current Schedule applicable to Western Arctic bowhead whales states that aboriginal subsistence catches "shall be permitted" so long as they are set at levels which will allow whale stocks to move to the Maximum Sustainable Yield level, and includes a prohibition on the striking, taking or killing calves or any whale accompanied by a calf, as well as a requirement that "all aboriginal whaling shall be conducted under national legislation that accords with [paragraph 13 of the Schedule]" (IWC 2018:13(a)(2), (4)&(5)). Accordingly, NOAA is generally required by the ICRW to establish aboriginal subsistence whaling catch limits for Western Arctic bowhead whales under the WCA.

At IWC67 in 2018, the IWC also added sub-paragraphs (6) and (7) to Schedule paragraph 13(a). New sub-paragraph 13(a)(6) contains an automatic renewal provision for sustainable status quo hunts, and new sub-paragraph 13(a)(7) contains a review provision, as follows:

> (6) Commencing in 2026, and provided the appropriate Strike Limit Algorithm has been developed by then, strike/catch limits (including any carry forward provisions) for each stock identified in sub-paragraph 13(b) shall be extended every six years, provided:
>
> > (a) the Scientific Committee advises in 2024, and every six years thereafter, that such limits will not harm that stock;

> (b) the Commission does not receive a request from an ASW country relying on the stock ('relevant ASW country'), for a change in the relevant catch limits based on need; and
> (c) the Commission determines that the relevant ASW country has complied with the approved timeline and that the information provided represents a status quo continuation of the hunt.

(7) The provisions for each stock identified in sub-paragraph 13(b), especially the provisions for carryover, shall be reviewed by the Commission in light of the advice of the Scientific Committee.[5]

Renewal of status quo bowhead catch limits will automatically occur if the three conditions in paragraph 13(a)(6) are satisfied. The first automatic renewal could occur in 2024, extending the catch limits for an additional six years from 2026 through 2031.

Paragraph 13(b) of the current Schedule further provides that subsistence whaling of Western Arctic bowhead whales "is permitted," subject to two limitations. One of those limitations is that the meat and products of such whales are to be used exclusively for local consumption. The second set is set forth in an independent sub-paragraph that establishes a set of numeric catch limits for a period of years. In 2018, the Commission amended paragraph 13(b)(1)(i) to read:

> For the years 2019, 2020, 2021, 2022, 2023, 2024 and 2025, the number of bowhead whales landed shall not exceed 392. For each of these years the number of bowhead whales struck shall not exceed 67, except that any unused portion of a strike quota from the three prior quota blocks shall be carried forward and added to the strike quotas of subsequent years, provided that no more than 50 percent of the annual strike limit shall be added to the strike quota for any one year.

(IWC 2018:13(b)(1)(i)). The Schedule, as amended by the Commission at its 2018 meeting, contains no numeric catch limits after 2025, and paragraph 13(b)(1)(i) will expire by its own terms at that time,[6] unless the catch limits are automatically renewed pursuant to paragraph 13(a)(6). Regardless, paragraph 13(a), including the requirement to set numeric catch limits discussed above, as well as the other provisions of paragraph 13(b), will continue to apply whether or not numeric catch limits are renewed.

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[5] See IWC 2018:13(a)(6)&(7)

[6] In 2002, the IWC did not update the numeric catch limits for bowhead whales in paragraph 13(b)(1)(i) at its Shimonoseki meeting. The IWC Secretary subsequently removed from the Schedule the outdated language which had expired by its own terms. See 2002 Annual Report of the IWC at 115. In contrast, outdated language continues to remain elsewhere in the Schedule, and the years in paragraph 13(b)(1) will become outdated if the catch limits are automatically renewed under paragraph 13(a)(6). See IWC/67/ASW/09 at 5 (Q/A 12).

In addition, paragraph 13(b)(1)(i) includes a "carryover" or "carry forward" provision. "Carryover" has been used by the IWC for many years to allow for the inter-annual catch variation that is a feature of this harvest, within limits that conserve the Western Arctic bowhead stock. The principle of carryover is to allow an unused portion of a strike quota from prior years to be carried forward and added to the strike quotas of subsequent years. Commencing in 2019, this carryover is subject to two limitations. First, any unused portion of a strike quota from the three prior quota blocks shall be carried forward and added to the strike quotas of subsequent years, and second, no more than 50 percent of the annual strike limit shall be added to the strike quota for any one year. This carryover provision reflects the 50 percent carryover principle endorsed and used by the IWC Scientific Committee to develop the SLA for Western Arctic bowhead whales.

As described more fully in Section 3.2.1, below, in 2002, the IWC adopted an SLA for Western Arctic bowhead whales to calculate appropriate levels for the strike limit (IWC, 2003a, b) that would achieve IWC management goals, including stock conservation, in a very wide range of scenarios. In 2017, the IWC's Scientific Committee reiterated its previous agreement that SLAs are robust with respect to a 50 percent inter-annual variability within blocks and to the same 50 percent allowance between the last year of one block and the first year of the next (2017 IWC Scientific Committee Report at 23). In 2018, the IWC's Scientific Committee advised that provisions allowing for the carry forward of unused strikes from the previous three blocks, subject to the limitation that the number of such carryover strikes used in any year does not exceed 50 percent of the annual strike limit, has no conservation implications (2018 IWC Scientific Committee Report at 21).

Native peoples engaging in subsistence hunts do so under authorization from their governments. In the case of Alaska Native and Russian Native subsistence hunts, the United States and the Russian Federation make a joint request to the IWC for bowhead whale catch limits, based, in part, on the needs of their respective Native communities.[7] The WCA provides the mechanism for the U.S. to implement applicable Schedule requirements, including any numeric catch limits.

1.2.3 Whaling Convention Act

The Whaling Convention Act[8] (WCA) was enacted to implement the domestic obligations of the U.S. government under the ICRW and its Schedule, and so NMFS's issuance of any catch limits

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[7] See **Appendix 8.1** for the 2018 statement of Alaska Native subsistence and cultural needs. In 2018, the IWC adopted the report of the IWC Aboriginal Subsistence Whaling Working Group and its recommendations, including its recommendation to replace the statement of need with a web-based Description of the Hunt. See 2018 Aboriginal Subsistence Whaling Working Group Report, IWC/67/ASW/Rep/01.

[8] The WCA is found at 16 U.S.C. §§ 916 *et seq*. For ease of reference, the U.S. Code cites to the sections of the WCA are used, and are shown as "WCA § 916 . . .".

in 2019 and beyond must implement those obligations. Schedule provisions to which the United States has not objected shall become effective with respect to all persons and vessels subject to the jurisdiction of the United States in accordance with the terms of the Schedule provisions and Article V of the ICRW (WCA § 916k). Further, Section 916c of the WCA makes it unlawful for any person to fail to do any act required by the ICRW, including the IWC Schedule, and Section 916j directs the Secretary of Commerce to implement the ICRW and the Schedule. Accordingly, NMFS is required to set aboriginal subsistence whaling catch limits for Western Arctic bowhead whales in compliance with the WCA and the Schedule. If the Schedule does not specify numeric catch limits, then NMFS must determine those catch limits under the WCA and in accordance with the management provisions of the Schedule. Under Section 916b of the WCA, the Secretary of State (with concurrence by the Secretary of Commerce) is vested with the power of presenting or withdrawing objections to regulations of the IWC on behalf of the United States as a Contracting Government.

The Secretary of Commerce holds general powers, which have been delegated to NMFS, to administer and enforce whaling[9] in the United States, including issuance of necessary regulations to carry out that authority (WCA §§ 916d, 916j, 916k). The regulations (at 50 CFR 230) prohibit whaling, except for aboriginal subsistence whaling authorized by paragraph 13 of the Schedule (50 CFR 230.2, 230.4). NMFS publishes aboriginal subsistence whaling catch limits set in accordance with paragraph 13 of the Schedule in the *Federal Register*, together with any relevant restrictions, and incorporates them into cooperative agreements with the appropriate Native American whaling organization, (entities recognized by this agency as representing and governing the relevant Native American whalers for the purposes of cooperative management of aboriginal subsistence whaling) (50 CFR 230.6(a)). Any catch limits issued are allocated to each whaling village or whaling captain by the appropriate Native American whaling organization.

The WCA regulations track the Schedule provisions that prohibit whaling of any calf or whale accompanied by a calf (50 CFR 230.4(c)); they also prohibit any person from selling or offering for sale whale products from whales taken in aboriginal subsistence hunts, except that "authentic articles of Native handicrafts" may be sold or offered for sale (50 CFR 230.4(f)) (defined under the MMPA as items composed wholly or in some significant respect of natural materials).

The WCA and its implementing regulations require licensing and reporting of aboriginal whale harvests (WCA § 916d; 50 CFR 230.5, 230.8). No one may engage in aboriginal subsistence whaling unless the person is a whaling captain or a crew member under the whaling captain's control (50 CFR 230.4(a)). The license may be suspended if the whaling captain fails to comply with WCA regulations (50 CFR 230.5(b)). No person may receive money for participation in

[9] Under Section 102(f) of the MMPA, 16 U.S.C. § 1371(f), commercial whaling is expressly banned in waters subject to the jurisdiction of the United States. (MMPA § 101(6)(2).) Regulations also require that whaling not be conducted in a wasteful manner (50 CFR 230.4(k), MMPA § 101(b)(3)).

aboriginal subsistence whaling (50 CFR 230.4(e)). The whaling captain and Native American whaling organization are also responsible for reporting to NMFS, among other things, the number, dates, and locations of strikes, attempted strikes, or landings of whales, including certain data from landed whales (50 CFR 230.8). For Alaska Native bowhead subsistence whaling, these provisions are also laid out in the Cooperative Agreement between NOAA and the AEWC for cooperative management of the bowhead whale subsistence hunt, entered into under section 112 of the MMPA (Appendix 8.2).

1.2.4 NOAA-AEWC Cooperative Agreement

The AEWC was formed in 1977 to represent the bowhead subsistence hunting communities of Alaska in an effort to convince the U.S. government to take action to preserve the Alaska Natives' subsistence hunt of bowhead whales. Alaskan whaling villages are among the most remote communities in the world. Not connected by a road system, they are reliant on the subsistence hunt of the bowhead whale for their survival. During the initial years of controversy over the health of the Western Arctic bowhead whale stock, the AEWC adopted its first Management Plan (November 1977), asserting the management and enforcement authority of the AEWC, requiring registration of whaling captains, specifying the traditional methods of whaling to be permitted, and requiring reporting of harvests and strikes by whaling captains (Langdon, 1984:45). With the signing of a Cooperative Agreement in 1981 under section 112 of the MMPA, the foundations for cooperation between NOAA and the AEWC were established, and this framework has endured to the present. The AEWC also agreed to cooperate with the United States in scientific research efforts and to develop a plan to be followed by all bowhead whale subsistence hunters to help improve the efficiency an animal welfare of the subsistence hunt.

The mission of the AEWC is "To safeguard the bowhead whale and its habitat, to defend the Aboriginal Subsistence Whaling Rights of our members, and to preserve the cultural and traditional values of our communities."

The AEWC's local management of the bowhead whale subsistence harvest ensures that the hunting is conducted in a traditional, non-wasteful manner. The AEWC promotes scientific research on bowhead whales to ensure their continued existence without unnecessary disruption to the whaling communities.

NOAA and the AEWC have agreed to work together through the Cooperative Agreement, but they bring different sources of authority to the cooperative effort. While federal authority for management of the bowhead whale subsistence hunt is governed by the WCA, the underlying authority of the AEWC is based on the formal cultural traditions of leadership by whaling captains. In addition, the tribal governments of the participating villages, including the Iñupiat Community of the Arctic Slope, have delegated to AEWC the tribal authority to manage the subsistence whaling of tribal members (Langdon, 1984:51). The members of the AEWC are the registered bowhead subsistence whaling captains and their crewmembers from the northern Alaskan communities. There are two classes of members: voting members and non-voting members from communities identified above in Section 1.1.2. Voting members are the registered bowhead subsistence whaling captains in each community. The crewmembers are non-voting members. The AEWC is directed by a board of elected Commissioners, one from each of the participating communities. This Board has authority over all of the Commission's affairs (AEWC By-Laws, 1981 and as amended and restated December 9, 2009).

The purposes of the NOAA-AEWC Cooperative Agreement are to:

- Protect the Western Arctic population of bowhead whales and the Eskimo culture;
- Promote scientific investigation of the bowhead whale; and
- Effectuate the other purposes of the WCA, the MMPA, and the ESA, as these acts relate to the aboriginal subsistence hunts for whales.

To achieve these purposes, the agreement provides for cooperation between members of the AEWC and NOAA in management of the subsistence bowhead whale hunt, and on any action undertaken or any action proposed to be undertaken by any agency or department of the Federal Government that may affect the bowhead whale and/or subsistence whaling. The agreement provides for an exclusive enforcement mechanism applied to any violation of the MMPA, the ESA, the WCA, the ICRW and its Schedule, the AEWC Management Plan, or the Cooperative Agreement itself by the registered member whaling captains or their crews. Thus, for actions of AEWC members as they relate to aboriginal subsistence bowhead hunts, the AEWC is the first line of enforcement (**Appendix 8.2** and **Section 3.6**). To support the scientific and administrative functions of the AEWC, NOAA has provided funds through annual grants, reaching as much as $400,000 per year in the early part of this decade (NOAA, 2007). The budget has been higher in recent years ($600,000 for 2013) (Lefevre, 2012).

Although the AEWC, the IWC, and NOAA initially had significantly different perspectives on the status of the bowhead population, the role of cooperative management in this case is highly distinctive in the degree to which the AEWC and the North Slope Borough (NSB) committed to a major peer-reviewed program of scientific research to improve understanding of the bowhead population status and dynamics in order to persuade the IWC to increase the subsistence catch limits (Langdon, 1984; Freeman, 1989). As improved census methods brought larger population estimates throughout the 1980s, the IWC raised the subsistence catch limits. This research vindicated the whaling captains' traditional knowledge perspective that the bowhead population was much larger than the alarmingly low science-based research estimates of the late 1970s.

1.2.5 Marine Mammal Protection Act and Endangered Species Act

The Marine Mammal Protection Act (MMPA) was enacted to protect and conserve marine mammals and their habitats. Section 2 of the MMPA contains the general purposes and policies of the act through congressional findings (16 U.S.C. 1361). Concerned that certain marine mammal species and population stocks were in danger of extinction or depletion, Congress established protections to encourage development of those stocks to the greatest extent feasible, commensurate with sound policies of resource management. Therefore, Congress specified that the primary objective of marine resource management under the MMPA is to maintain the health and stability of the marine ecosystem. Section 2 indicates that stocks should not be permitted to diminish beyond the point at which they cease to be a significant functioning element of the ecosystem, and they should not be permitted to diminish below their optimum sustainable population (OSP). To achieve Section 2 general purposes and policies, Congress established a moratorium on the taking and importing of marine mammals in Section 101(a) (16 U.S.C. 1371(a)). Under the MMPA, 'take' means to "harass, hunt, capture, or kill, or attempt to harass, hunt, capture, or kill any marine mammal" (16 U.S.C. 1362(13)). Except for certain military readiness or scientific activities, the term 'harassment' means "any act of pursuit, torment, or annoyance which, (1) has the potential to injure a marine mammal or marine mammal stock in the wild [Level A Harassment]; or (2) has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering [Level B Harassment]" (16 U.S.C. 1362(18)(A)).

This moratorium is not absolute. In particular, the MMPA exempts the take of marine mammals by Alaska Natives for subsistence purposes from the moratorium, provided that such activities are not accomplished in a wasteful manner (16 U.S.C. 1371(b)). Further, Congress prohibited the issuance of permits to allow limited takes of marine mammals in other activities if doing so would result in an “unmitigable adverse impact” to the availability of marine mammals for Alaska Native subsistence hunting. (16 U.S.C. 1371(a) (5)). Inedible by-products such as baleen, bone, and ivory may be fabricated into Native handicrafts for sale under the same section of the MMPA. In addition, Section 113 of the MMPA specifically states that the provisions of the MMPA are in addition to, and not in contravention of, existing international treaties, conventions, or agreements (e.g., the ICRW) (16 U.S.C. 1383(a)).

The Endangered Species Act (ESA) is the principal federal law that guides the conservation of endangered or threatened species. Similar to the MMPA, the ESA expressly provides for Alaska Native subsistence activities (16 U.S.C. 1539(e)). Under section 7 of the ESA, NMFS consults with itself and with the U.S. Fish and Wildlife Service (USFWS) on the effects of its proposed actions on endangered and threatened species.

1.2.6 Marine Protection, Research, and Sanctuaries Act

Under the Marine Protection, Research, and Sanctuaries Act (MPRSA), the Environmental Protection Agency (EPA) has issued a general permit to authorize the transport and disposal of marine mammal carcasses, including bowhead whale carcasses, in ocean waters under certain conditions. The MPRSA general permit does not require that marine mammal carcasses be disposed of in ocean water but authorizes ocean disposal when there is a need. The general permit was published in the Federal Register on December 6, 2016 (81 FR 87928). Subsistence use of Western Arctic bowhead whales generally does not include disposal of their carcasses in ocean waters.

1.2.7 National Environmental Policy Act

The National Environmental Policy Act (NEPA) was enacted to create and carry out a national policy designed to encourage harmony between humankind and the environment. While NEPA neither compels particular results nor imposes substantive environmental duties upon federal agencies (*Robertson v. Methow Valley Citizens Council*, 490 U.S. 332 (1989)), it does require that federal agencies follow certain procedures when making decisions about any proposed federal actions that may affect the environment. These procedures ensure that an agency has the best possible information with which to make an informed decision with regard to environmental effects of any proposed action. They also ensure that the public is fully apprised of any associated environmental risks. Regulations promulgated by the Council on Environmental Quality (CEQ) (40 CFR 1500-1508) contain specific guidance for complying with NEPA.

Under the CEQ regulations, federal agencies must prepare an environmental assessment (EA) to determine whether a proposed action is likely to have a significant impact or effect on the quality of the human environment, or an EIS, which involves a longer public process. Proposed alternatives are analyzed both in terms of context and intensity of the action. If information in an EA indicates that the environmental effects are not significant, the agency issues a finding of no significant impact (FONSI) to conclude the NEPA review. This was the case in 2003 when NMFS published a final EA and FONSI in support of the 2003 through 2007 bowhead whale catch limit allocations to AEWC (NMFS, 2003).

For the 2008 through 2018 catch limit blocks, NMFS decided to prepare EISs rather than EAs (NMFS 2008 a, b, 2013). These decisions were not based on any new determination that significant effects occur as a result of the bowhead subsistence hunt, but rather to take advantage of the EIS's longer process and to provide greater transparency and opportunity for public review of its administration of the bowhead subsistence whaling program. The 2008 and 2013 EISs provided a more detailed statement of the environmental impacts of the action, possible alternatives, and measures to mitigate adverse effects of the proposed actions. The EISs achieved NEPA's policy goals by ensuring that agencies were able to take a hard look at environmental consequences and by guaranteeing broad public dissemination of relevant information. Although the MMPA and NEPA requirements overlap in some respects, the scope of NEPA goes beyond that of the MMPA by considering the impacts of the proposed federal action on non-marine mammal resources such as human health and cultural resources.

For catch limits from 2019 onward, NMFS has again decided to prepare an EIS with a long timeframe for analysis. The last two decades have shown that the bowhead population continues to grow at a robust rate and that subsistence harvests do not adversely affect the bowhead population. NMFS proposes that the current EIS should provide an estimate of environmental effects for a 25- or 30-year period, recognizing that periodically NMFS would prepare an EA to examine whether any changes in the bowhead population, the subsistence harvest practices, or in cumulative effects would constitute significant effects requiring an EIS. As indicated in its scoping comments, EPA would support NMFS utilizing an EA process in the future, as long as monitoring results continue to indicate that the subsistence bowhead whale harvest and other cumulative effects result in less than significant impacts to the marine environment.

An EIS culminates in a Record of Decision (ROD). The ROD will document the alternative selected for implementation as well as any conditions this agency imposes, and it will summarize the impacts expected to result from the action.

1.3 Public Involvement and Scoping Process

NEPA is often referred to as a “procedural statute.” The law requires opportunities for public review and submission of comments. In preparing an EIS, the public process begins with scoping, which is the agency’s first step in planning its analysis. The lead agency will typically consult with expert staff in determining the proper way to describe the proposed action, its alternative actions, and the environmental issues it feels are important to analyze in the document. The agency will also alert the public and affected stakeholders to its decision to prepare an EIS and solicit input into the scope of the document. With this information, the agency will prepare a draft EIS and make that document available for a minimum 45-day public review. Public meetings during the review period may be scheduled, depending on the level of interest in the proposed action by the public. Once the public review period on the draft EIS is completed, the agency will review comments received and respond to those comments and make revisions to the draft EIS to answer questions, provide increased clarity, and if need be, conduct additional analysis where previous analysis was found lacking. Once completed, the agency publishes a final EIS document and, after a minimum 30-day review period, issues its ROD. The scoping process for this EIS involved a number of activities that included both internal and public scoping. These activities are described in the following paragraphs.

1.3.1 Internal Scoping

During the internal scoping phase, NMFS identified a preliminary list of resources to address in the EIS, along with four preliminary alternatives, including the no-action alternative, to serve as starting points for discussion. These alternatives and issues were previously analyzed in the 2008 Final EIS for Issuing Annual Quotas to the Alaska Eskimo Whaling Commission for a Subsistence Hunt on Bowhead Whales for the Years 2008 through 2012 (NMFS, 2008a and 2008b), and the 2013 Final EIS for Issuing Annual Quotas to the Alaska Eskimo Whaling Commission for a Subsistence Hunt on Bowhead Whales for the Years 2013 through 2018 (NMFS 2013). This effort was conducted to help the public provide more meaningful comment on resource issues and alternatives to the proposed action during the public scoping period with the intention of reevaluating resources and alternatives, if needed, following receipt and review of public comment.

1.3.2 Public Scoping

On August 15, 2017, NMFS issued a Notice of Intent to prepare an EIS for issuing a bowhead whale subsistence catch limits to the AEWC from 2019 onward (82 FR 38671). NMFS requested comments on the proposed issuance of annual catch limits from 2019 onward, requested information on the affected environment, and requested comments on the issues to be analyzed in the document. Two local Alaska newspapers reported on NMFS's notice. Comments from the public were accepted through September 14, 2017.

During the scoping period, a total of eight scoping comment submissions were received: two from the general public; one from the AEWC; one from the Mayor of the North Slope Borough; one from the State of Alaska; one from the non-governmental organizations, the Animal Welfare Institute (AWI) and Whale and Dolphin Conservation (WDC); and two from federal agencies, i.e., the EPA and the Marine Mammal Commission (MMC).

NMFS's allocation of a bowhead whale subsistence harvest quota has been a recurring action for four decades. As a result, many stakeholders are familiar with the action, and this may explain why a limited number of public comments were received. The issues raised in the scoping comments are incorporated and addressed in the preparation of this FEIS. The following paragraphs summarize these comments, drawing attention to those that augmented the issues already identified for analysis by NMFS.

The scoping comments from a member of the general public questioned the need to hunt bowhead whales for food, and indicated in part that there should be better information on the population size of bowhead whales. **Section 3.2** describes the current abundance, trends, genetics, and status of Western Arctic bowhead whales. **Section 3.5** describes the Alaska Native subsistence uses of bowhead whales and the history of the IWC acceptance of determinations of the subsistence and cultural need for bowhead whales (see also **Appendix 8.1**). The commenter also identified a number of environmental factors and human activities that NMFS should assess in the EIS. **Sections 3.2 and 4.4 – 4.8** describe the affected environment and the environmental consequences of NMFS's proposed action within that context.

The scoping comments from AWI and WDC included NEPA procedural concerns and a variety of topics for analysis in the EIS, with emphasis on the importance of an up-to-date, accurate, credible, and objective analysis. AWI and WDC requested up-to-date scientific evidence about the ecology and biology of the bowhead whale. AWI and WDC requested that Alaska Native subsistence need for bowhead whales be evaluated in the context of the EIS. AWI and WDC also requested a disclosure of the level of federal funding allocated to the AEWC and the whaling villages for, at a minimum, the past twenty years, and how these funds were used. AWI and WDC requested that any and all known or potential threats to the bowhead whale, its habitat including its prey, and its migration pattern be disclosed and evaluated. Finally, with regard to harvest methods and techniques, AWI and WDC suggested a discussion of the likely fate of struck whales not landed, and data that shows struck/loss rate over time, as well as analysis of the reasons that caused struck whales to be lost; and a description of both the fall and spring bowhead hunts for each community, including analysis of hunting methods and hunting efficacy as measured in time to death data, and descriptions of use and sharing practices.

The EIS addresses the required NEPA procedures throughout the development of the document, and a comprehensive and objective cumulative effects analysis is found in **Sections 4.6, 4.7** and **4.8**. The questions regarding funding for the AEWC are beyond the scope of this EIS. The population biology and ecology of bowhead whales are addressed in Sections 3 and 4. For struck and lost rates over time, see **Figure 3.2.4-1**. The fate of struck and lost whales is reported by whaling captains and AEWC has made significant efforts to improve harvest efficiency in order to reduce the number of struck and lost whales. Efforts to improve harvest technology and to reduce average time-to-death are described in **Section 2.5.1**.

The scoping comments from the AEWC indicated that the Western Arctic bowhead population is increasing, as is the subsistence need for bowhead whales. Among other things, the AEWC stated that the bowhead harvest provides essential nutritional, cultural, and social benefits to its villages and to the many communities throughout northern Alaska with whom it shares the bowhead whale resource. In particular, the AEWC indicated that, as has been the case throughout history:

(1) The social complex of its communities rests on the organized activities that make up the bowhead whale harvest and the sharing of the whale;

(2) The quantity and nutritional value of the bowhead harvest for its communities and for those with whom it shares is not available by any other means; and

(3) The social cohesion crucial to its survival as an Arctic People would be lost without the opportunity for this harvest and the sharing that accompanies it.

The AEWC also indicated that as environmental conditions in the Arctic continue to change, the bowhead whale and the AEWC's bowhead harvest sharing networks are becoming increasingly important to its communities and to its sharing partners. Accordingly, the AEWC requested that NMFS analyze an additional alternative that allows for an increase in the harvest level to 100 strikes per year from the current 67 strikes.

NMFS has included an additional alternative that will assess the impacts of a higher level of harvest, given: (1) the timeframe for NMFS's proposed action, i.e., from 2019 onward, where it is likely that the AEWC's subsistence need for bowhead whales will increase over this timeframe; and (2) the increasing size of the Western Arctic bowhead whale population. As with the other alternatives, NMFS's issuance of any future catch limits will be subject to IWC requirements, which will in turn, be based on IWC Scientific Committee advice on the sustainability of those catch limits. **Section 3.2** describes the current abundance, trends, genetics and status of Western Arctic bowhead whales. **Sections 3.5 and 4.8** describe the importance of the bowhead whale hunt and Alaska Native subsistence uses of bowhead whales, including sharing of bowhead whale products with others in the local community or with persons in locations other than the local community with whom local residents share familial, social, cultural, or economic ties. Finally, changes in the environment and changing activities in the Arctic are addressed in **Sections 3.2 and 4.6**.

The scoping comments from the North Slope Borough (NSB) focused on the subsistence need for Western Arctic bowhead whales by Alaska Native communities, the increasing abundance of bowhead whales, and the successful management of bowheads. The NSB also reported that Alaska Native hunters continue to have challenges accessing whales, in part, due to a changing environment. Finally, the NSB agreed with the AEWC that there should be an alternative that allows for an increased quota.

The scoping comments from the State of Alaska expressed support for the continued harvest of bowhead whales as an important and sustainable harvest that provides substantial nutritional and cultural value to many Alaskans. The State of Alaska also requested that an additional alternative should be included in the EIS that allows for a higher level of harvest if a need for the increase can be demonstrated.

The scoping comments from federal agencies focused for the most part on NEPA procedural questions. The EPA letter emphasized the importance of meeting NEPA requirements for the components of the EIS, including a reasonable range of alternatives that meet the purpose and need. EPA also suggested a robust monitoring program with clear goals and objectives, specific responsibilities for conducting these monitoring activities, and wide availability of the results of these monitoring activities. In addition, attention was directed to requirements under the ESA, and under EOs concerning consultation with federally recognized tribes and analysis of environmental justice. EPA policy suggestions concerning cooperating agency status for affected Alaska Native tribes were highlighted. Finally, EPA also suggested recognition of impacts to the traditional trade and bartering activities with bowhead meat, bone, and baleen through the year with residents of non-whaling communities.

The EIS has been developed in compliance with NEPA procedures and requirements. Monitoring activities regarding the subsistence harvest are described in **Section 3.6.3**, while population assessments are described in **Section 3.2.1**. Traditional trade and bartering are an important part of the cultural context of bowhead subsistence harvest patterns and are addressed in **Section 3.5**, Alaska Native Tradition of Subsistence Hunt of Bowhead Whales.

The MMC recommended an additional alternative if there is any possibility that the U.S. will seek an increase in the current annual strike limit or an increase in the catch limits. The MMC also indicated that, assuming NMFS will use its 2013 FEIS as the starting point for the new EIS, the sections most likely to be in need of updating are those concerning cumulative effects.

As indicated above, NMFS has included an additional alternative that will assess the impacts of increased catch limits, given: (1) the timeframe for NMFS's proposed action, i.e., from 2019 onward, where it is likely that the AEWC's subsistence need for bowhead whales will increase over this timeframe; and (2) the increasing size of the Western Arctic bowhead whale population. **Section 4** evaluates the environmental consequences of NMFS's proposed action, including an analysis of cumulative effects.

1.3.3 Public Review of the Draft EIS

The Draft EIS was released for public review on June 14, 2018, when a Notice of Availability was published in the *Federal Register* (83 FR 27756). The public review period ended on July 31, 2018.

During the review period, NMFS received a total of six comment letters[10] from the following:

[10] See Appendices 8.6 and 8.7 for a summary and analysis of comments received.

1. Alaska Bering Sea Crabbers (ABSC), letter dated July 20, 2018
2. State of Alaska Department of Fish and Game (ADF&G) Division of Wildlife Conservation, letter dated July 23, 2018
3. U.S. Environmental Protection Agency (EPA), letter dated July 25, 2018
4. Marine Mammal Commission (MMC), letter dated July 31, 2018
5. Alaska Eskimo Whaling Commission (AEWC), letter dated July 31, 2018
6. North Slope Borough (NSB), letter dated July 31, 2018

The ABSC letter indicated, in part, that ABSC is working to better understand the impacts of the Bering Sea crab fishery on bowhead whales by coordinating with the AEWC, the NSB, NMFS, and other agencies on research and monitoring. The ADF&G letter agreed that Alternative 4 is the preferred alternative and best meets the purpose and need by achieving the socio-cultural benefits of the subsistence hunt with minimal effects to the bowhead population. The EPA letter concluded that the Draft EIS provides an adequate discussion of the potential environmental impacts, and stated that EPA did not identify any potential impacts requiring substantive changes to the proposal. The MMC agreed that Alternative 4 is the alternative that NMFS should implement if the Schedule amendment proposed by the United States and others for governing bowhead whale subsistence hunting in 2019 and beyond is adopted at the IWC meeting.[11] The AEWC letter expressed support for the conclusions drawn in the Draft EIS and the adoption of NMFS's preferred alternative (Alternative 4). The AEWC highlighted that today, as for millennia past, the bowhead whale and the subsistence harvest play critical roles in the nutritional and cultural health of Alaska's northern communities and are central to the mixed subsistence-cash economy of northern Alaska and of Native communities throughout the State. The AEWC also noted that its whaling captains have been presenting the IWC with direct observations of the overall health, including reproductive health, of the Western Arctic bowhead whale population. The North Slope Borough letter supported NMFS's selection of Alternative 4 as the preferred alternative, emphasized the great importance of the bowhead hunt, and noted the importance of the Borough's research program. For forty years, the Borough has studied the health of the Western Arctic bowhead whale stock and provided significant financial and scientific support to the AEWC.

Substantive comments are addressed in responses to comments, and NMFS has revised the text of the Final EIS as appropriate. **Appendix 8.7** details the comments on the Draft EIS and provides responses to each comment.

[11] At IWC67 in 2018, the Commission adopted a revised four-country proposal that contains only a slight change to the original Schedule amendment proposal referenced by the MMC regarding the bowhead-specific catch limits of Schedule paragraph 13(b)(1). Compare the revised proposal to amend paragraph 13(b)(1) in document IWC/67/01 Rev 01 with the original proposal in document IWC/67/01.

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2.0 ALTERNATIVES, INCLUDING THE PROPOSED ACTION

Under the WCA, NMFS is required to issue annual bowhead whale catch limits based on IWC Schedule provisions pertaining to the aboriginal subsistence harvest of Western Arctic bowhead whales.

NMFS's issuance of any future catch limits will be subject to IWC requirements, which will in turn, be based on IWC Scientific Committee advice on the sustainability of any catch limits. In 2003, the IWC adopted the "Bowhead Strike Limit Algorithm" (Bowhead SLA) for setting the quota for Western Arctic bowhead whales (IWC 2003a,b). The Bowhead SLA is further described in **Section 3.2.1**, but it is important to note that the SLA explicitly considered uncertainty in its population simulations and sought to ensure that the Bowhead SLA would provide conservative management advice and meet IWC objectives for the management of stocks subject to aboriginal subsistence takes (cf. IWC, 1999). The subsequent domestic bowhead hunt is managed cooperatively by NMFS and the AEWC (**Appendix 8.2**).

With respect to the use of unused strikes from previous years (carry-forward or carryover), it is important to note that the Bowhead SLA has confirmed that, over the long-term, carryover does not change the overall number of strikes taken, rather it alters the timing of the use of those already-allocated strikes. As a result, the SLA confirmed that a carry forward provision of up to 50 percent of the annual strike limit is sustainable.

The IWC quota for landed bowhead whales is allocated between Alaska Natives and Russian Chukotkan Natives through a bilateral agreement between the United States and Russian Federation governments (**Appendix 8.3**) in order to ensure that the limits in the Schedule are not exceeded. The actual allocation of strikes between these Native groups is determined on an annual basis through the agreement.[12] It is expected that, following the actions of the IWC at its September 2018 meeting in updating the bowhead aboriginal subsistence harvest catch limits, the U.S. and the Russian Federation would sign a new agreement later in 2018 with a similar allocation between the two Native groups.

[12] For 2018, the U.S./Russian agreement provides that, of the total allocation of 336 landed bowhead whales over six years, the AEWC can land up to 306. The total annual allocation of 67 strikes, plus a "carryover" or "carry forward" of up to 15 unused strikes, results in a combined strike quota of 82 (67 + 15). Of that total, NMFS granted the AEWC a 2018 strike limit of 75 strikes. Presumably, a 2019 U.S./Russian agreement would account for an increased carryover of up to 50 percent, or 33 strikes, for a combined strike quota of 100 (67 + 33).

<u>Results of 2018 IWC Meeting, Including Seven-Year Catch Limits, Revised Carryover Provisions, and Automatic Renewal</u>

The IWC met in September 2018 in Florianopolis, Brazil, and based on the management advice of the IWC Scientific Committee, adopted a catch limit for 2019 through 2025 at the same annual levels as the previous quota block, i.e., an annual strike limit of 67 whales. (See **Section 1.2.2**.) In addition, the IWC increased the allowable carryover of unused strikes. Revised Schedule paragraph 13(b)(1) provides, in part, that "any unused portion of a strike quota from the three prior quota blocks shall be carried forward and added to the strike quotas of subsequent years, provided that no more than 50 percent of the annual strike limit shall be added to the strike quota for any one year."

The IWC also adopted a one-time seven-year catch limit[13] for bowhead whales at its 2018 meeting, where the numeric limits will expire at the end of 2025, rather than at the end of 2024. In addition to the review provided in the Schedule, the IWC will review and update the numeric limits in 2024, one year before those limits will expire. Also in 2024, this "buffer year" can be preserved by extending the catch limits (either automatically under paragraph 13(a)(6) or by a decision of the Commission) for an additional six years from 2026 through 2031.

The total number of bowhead whales that can be landed over that seven-year period has been increased by 1/6 from 336 to 392, and the total number of bowhead whales that can be landed over any six-year period will remain unchanged at 336. Since the action Alternatives, below, evaluate the impacts of a take of 336 whales over "any" six-year period, they account for a one-time seven-year renewal.

Finally, as indicated in **Section 1.2.2**, above, the IWC adopted an automatic renewal provision for sustainable status quo catch limits. Renewal of status quo bowhead catch limits will automatically occur if the three conditions in Schedule paragraph 13(a)(6) are satisfied. The first automatic renewal could occur in 2024, extending the catch limits for an additional six years from 2026 through 2031. The timeframe for the proposed action evaluated in this EIS is 2019 and beyond, which accounts for the possibility of a renewal of the catch limits. As stated in **Section 1.2.7**, the EIS provides an estimate of environmental effects for a 25- or 30-year period, recognizing that periodically NMFS would prepare an EA to examine whether any changes in the bowhead population, the subsistence harvest practices, or in cumulative effects would constitute significant effects requiring an EIS. Since the action Alternatives, below, evaluate the

[13] In September of 2015, the IWC held an expert workshop in Maniitsoq, Greenland, regarding several issues pertaining to aboriginal subsistence whaling. The report of that workshop notes the possibility of a one-time seven-year catch limit (IWC, 2015). That concept was also discussed by the IWC's Aboriginal Subsistence Whaling Working Group, in Utqiaġvik (Barrow), in April of 2018 (IWC, 2018).

impacts of a take of 336 whales over “any” six-year period, they also account for the possibility of automatic renewals.

There are five Alternatives considered, but Alternative 4 is the preferred alternative. Under Alternative 4, NMFS would grant the AEWC the U.S. portion of a maximum annual strike limit of 100 strikes, i.e., 67 annual strikes plus up to 33 unused strikes from previous years which can be carried forward, subject to limits, and added to the annual strike quota of subsequent years. These strike limits would be subject to the U.S. portion of a maximum total of 336 landed whales over any six-year period. This Alternative is preferred because it meets the purpose and need of this action, and it achieves the socio-cultural benefits of the subsistence hunt at minimal environmental cost.

2.1. Alternative 1 (No Action)

Do not grant the AEWC a catch limit.

Under this alternative, NMFS would not grant the AEWC the U.S. portion of a subsistence whaling quota for cultural and nutritional purposes, notwithstanding the IWC Schedule’s requirement to establish catch limits and permit aboriginal subsistence whaling for Western Arctic bowhead whales, subject to certain limitations. Increased catch limits would then become available for a bowhead hunt by Russian Chukotkan Natives, depending on their needs. This alternative would be contrary to the IWC Schedule, and because the WCA requires NMFS to implement requirements of the IWC Schedule, this alternative would also be contrary to the WCA.

2.2. Alternative 2

Grant the AEWC an annual strike limit of 67 bowhead whales, not to exceed a total of 336 landed whales over any 6-year period, with no unused strikes from previous years added to the subsequent annual limit as carry-forward.

Under this alternative, NMFS would grant the AEWC the U.S. portion of an annual strike quota of 67 bowhead whales, not to exceed the U.S. portion of a total of 336 landed whales over any 6-year period. Under this alternative, no unused strikes from a previous year would be added to the strike quota for a subsequent year as carry-forward, notwithstanding the IWC’s requirement to “carryover” or “carry forward” unused strikes in the bowhead subsistence catch limits. Because the IWC Schedule requires unused strikes to be carried forward and added to the strike quotas of subsequent years, subject to limits, this alternative would be contrary to the IWC Schedule. As the WCA requires NMFS to implement requirements of the IWC Schedule, this alternative would also be contrary to the WCA.

2.3. Alternative 3

Grant the AEWC an annual strike limit of 67 bowhead whales, not to exceed a total of 336 landed whales over any 6-year period, with unused strikes from previous years carried forward and added to the annual strike limit of subsequent years (subject to limits), provided that no more than 15 additional strikes are added to any one year's allocation of strikes. This alternative would maintain the status quo for any 6-year period with respect to management of the hunt.

Under this alternative, NMFS would grant the AEWC the U.S. portion of an annual strike quota of 67 bowhead whales (plus up to 15 strikes as carry-forward), not to exceed the U.S. portion of a total of 336 landed whales over any 6-year period. This alternative differs from Alternatives 1 and 2 by allowing the AEWC to carry forward unused strikes from previous years, and add up to 15 of those unused strikes per year to the catch limits for any subsequent years, consistent with the current IWC Schedule. A carry-forward allows for variability in hunting conditions from one year to the next within limits that conserve the Western Arctic bowhead stock and is a long-standing feature of this quota structure.

2.4. Alternative 4 (Preferred Alternative)

Grant the AEWC an annual strike limit of 67 bowhead whales, not to exceed a total of 336 landed whales over any 6-year period, with unused strikes from previous years carried forward and added to the annual strike quota of subsequent years (subject to limits), provided that no more than 50 percent of the annual strike limit is added for any one year. This alternative would maintain the status quo for any 6-year period with respect to management of the hunt for landed whales and employ the Commission's agreed-upon 50 percent carryover principle.

Under this alternative, NMFS would grant the AEWC the U.S. portion of an annual strike quota of 67 bowhead whales (plus carry-forward), not to exceed the U.S. portion of a total of 336 landed whales over any 6-year period. This alternative differs from Alternatives 1 and 2 by allowing the AEWC to carry forward unused strikes from previous years. This alternative differs from Alternative 3 by allowing the AEWC to carry forward unused strikes from previous years, provided that no more than 50 percent of the annual strike limit is added for any one year, consistent with the IWC's 50 percent carryover principle[14]. A carry-forward allows for

[14] As described in Sections 1.2.2 and 3.2.1, in 2002, the IWC adopted a "Strike Limit Algorithm" (SLA) for Western Arctic bowhead whales to calculate appropriate levels for the strike limit (IWC, 2003a, b) that would achieve IWC management goals, including stock conservation, in a very wide range of scenarios. In 2017, the IWC's Scientific Committee reiterated its previous agreement that SLAs are robust with respect to a 50 percent

variability in hunting conditions from one year to the next within limits that conserve the Western Arctic bowhead stock and, as noted, is a long-standing feature of this quota structure.

2.5. Alternative 5

Grant the AEWC an annual strike limit of 100 bowhead whales, not to exceed a total of 504 landed whales over any 6-year period, with unused strikes from previous years carried forward and added to the annual strike quota of subsequent years (subject to limits), provided that no more than 50 percent of the annual strike limit is added for any one year. This alternative would increase the harvest levels by 50 percent and employ the Commission's agreed-upon 50 percent carryover principle.

Under this alternative, NMFS would assess the impacts of a higher level of harvest, given: (1) the timeframe for NMFS's proposed action, i.e., from 2019 onward, where it is likely that the AEWC's subsistence need for bowhead whales will increase over this timeframe; and (2) the increasing size of the Western Arctic bowhead whale population. As with the other alternatives, NMFS's issuance of any future catch limits will be subject to IWC requirements, which will in turn, be based on IWC Scientific Committee advice on the sustainability of those catch limits.

Under this alternative, NMFS would grant the AEWC the U.S. portion of an annual strike quota of 100 bowhead whales (plus carry-forward), not to exceed the U.S. portion of a total of 504 landed whales over any 6-year period. This alternative differs from Alternatives 1 through 4 by increasing the harvest levels by 50 percent, and differs from Alternatives 1 through 3 by employing the IWC's 50 percent carryover principle[15]. A carry-forward allows for variability in hunting conditions from one year to the next within limits that conserve the Western Arctic bowhead stock and, as noted, is a long-standing feature of this quota structure.

2.6. Alternatives Considered but Not Carried Forward

Alternatives considered but discarded included alternatives that substantially decreased the annual bowhead whale subsistence catch limits for Alaska Natives. A substantially decreased catch limit would not meet the documented need of Alaska Natives for bowhead subsistence foods. One option under Alternative 1 would be to compensate the AEWC for not exercising its aboriginal subsistence rights. While it may be appropriate for the AEWC to receive

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inter-annual variability within blocks and to the same 50 percent allowance between the last year of one block and the first year of the next (2017 IWC Scientific Committee Report at 23.) In 2018, the IWC's Scientific Committee advised that provisions allowing for the carry forward of unused strikes from the previous three blocks, subject to the limitation that the number of such carryover strikes used in any year does not exceed 50 percent of the annual strike limit, has no conservation implications. (2018 IWC Scientific Committee Report at 21.)

[15] See footnote 14, above.

compensation for economic harm due to a prohibition of a commercial activity, in this case the AEWC is requesting a quota for cultural and nutritional subsistence purposes, something that cannot be compensated financially. Such alternatives were rejected because they do not meet the first objective of the proposed action, which is to meet the documented cultural and nutritional needs for bowhead whales by Alaska Natives. While the No Action Alternative does not meet this first objective, NMFS has included it in accordance with NEPA.

2.7. Environmentally Preferred Alternative

NEPA requires that an agency identify the environmentally preferred alternative when preparing the ROD for an EIS. The CEQ has advised that such an alternative is to be based only on the physical and biological impacts of the proposed action on the resources in question, and not the social or economic impacts of the action. In this EIS, Alternative 1 (No Action) would not authorize annual subsistence bowhead whaling by Alaska Natives, and no bowhead whales would be taken by them. Therefore, Alternative 1 is identified as the environmentally preferred alternative based on impacts to bowhead whales from a hunt by Alaska Natives. See **Section 4** for a full analysis of predicted impacts of this alternative on the complete human environment.

2.8. Preferred Alternative

NMFS has identified Alternative 4 as its preferred alternative because it meets the purpose and need of this action, and it achieves the socio-cultural benefits of the subsistence hunt at minimal environmental cost. Alternative 4 also corresponds to the action taken by the IWC during its 67th meeting in September 2018 in Florianopolis, Brazil. At that meeting, the IWC acted on the management advice of the IWC Scientific Committee and adopted a catch limit for 2019 through 2025, with a provision for increased carryover of unused strikes, and with a provision for automatic renewal of sustainable status quo catch limits. Under the WCA, NMFS is required to implement the ICRW Schedule’s provisions, including its provisions regarding catch limits.

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3.0 AFFECTED ENVIRONMENT

3.1 Geographic Location

The Western Arctic stock of bowhead whales occurs in the Bering, Chukchi, and Beaufort seas. The Bering Sea is in the northernmost region of the Pacific Ocean, bordered on the north and west by the Russian Federation, on the east by mainland Alaska, and on the south by the Aleutian Islands. The Bering Sea is connected to the Arctic Ocean, which includes the Chukchi Sea on the northern side of the Bering Strait and the Beaufort Sea to the east of the Chukchi Sea.

3.2 The Western Arctic Stock of Bowhead Whale

Bowhead whales are distributed in seasonally ice-covered waters of the Arctic and near-Arctic, generally north of 54°N and south of 75°N in the Western Arctic Basin (Moore and Reeves, 1993). The International Whaling Commission (IWC) recognizes four bowhead whale stocks (IWC, 2010a): the Davis Strait and Hudson Bay stock inhabiting western Greenland and eastern Canadian waters); the Okhotsk Sea stock located in Russia's Okhotsk Sea; the Spitsbergen stock near Svalbard in the eastern North Atlantic; and the Western Arctic Stock, sometimes referred to as the Bering-Chukchi-Beaufort Seas (BCBS) stock (**see Figure 3.2-1**), inhabiting waters of the Bering, Chukchi, and Beaufort seas off Alaska, northeastern Russia and northwestern Canada.

The Western Arctic stock is the largest of the four bowhead whale stocks and is the only stock found within U.S. waters (Rugh et al., 2003). Although Jorde et al. (2007) suggested there might be multiple stocks of bowhead whales in U.S. waters, several studies (George et al. 2007, Taylor et al. 2007, Rugh et al. 2009) and the IWC Scientific Committee concluded that data are most consistent with one stock that migrates throughout waters of northern and western Alaska (IWC 2008). Western Arctic bowhead whale stock structure was reevaluated at the IWC Scientific Committee's 2012 Implementation Review of bowhead whales associated with the quota renewal of that same year. Bickham et al. (2012) analyzed a larger and more current bowhead genetic dataset and Quakenbush et al (2012) reported on results of the satellite telemetry data. In their evaluation, the Scientific Committee found the new analyses confirmed earlier findings that the data are consistent with a single stock status for Bering-Chukchi-Beaufort bowhead whales (2012 IWC Scientific Committee Report).

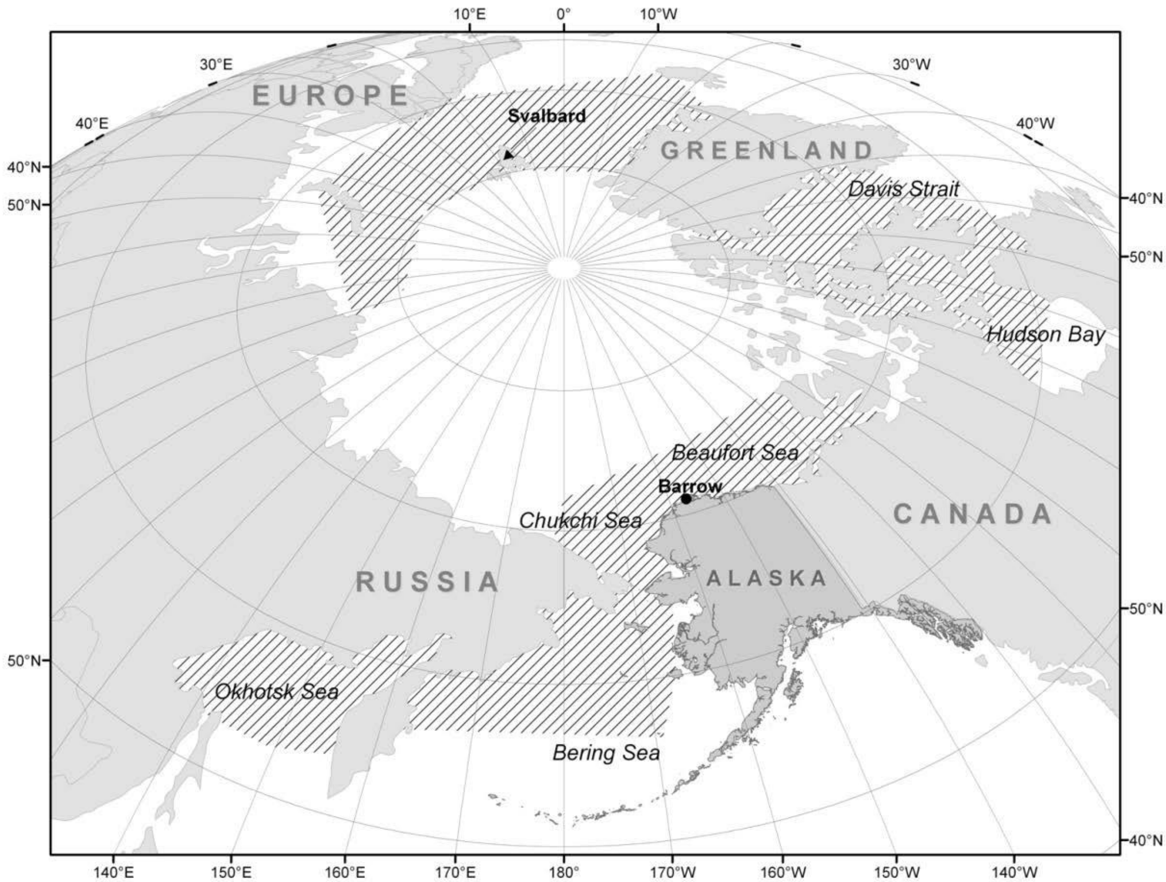


Figure 3.2-1. Circumpolar area occupied by the four bowhead whale stocks.

3.2.1 Current Abundance, Trends, Genetics, and Status

Abundance and Trends. All stocks of bowhead whales were severely depleted during intense commercial whaling, starting in the early 16th century near Labrador, Canada (Ross 1993), and spreading to the Bering Sea in the mid-19th century (Braham 1984, Bockstoce and Burns 1993, Bockstoce et al. 2007). The Sea of Okhostk and Spitsbergen bowhead stocks have not shown significant evidence of recovery even though a century has passed since commercial whaling stopped (Woodby and Botkin 1993). The Western Arctic and Davis Strait/Hudson Bay stocks have recovered significantly (Zeh et al. 1993).

In order to assess the size of this stock, the National Marine Fisheries Service (NMFS) began a study of abundance in 1976 by conducting visual counts of whales during the spring while they were migrating past ice-based sites north of Point Barrow, Alaska (Krogman 1980). The traditional ecological knowledge (TEK) of Alaska Native whalers pointed out shortcomings in the visual counts such as a lack of correction factors for whales that continued to migrate past the census site under the ice of closed leads or that migrate farther offshore (Huntington 2000). Census counts have been conducted under the direction of the North Slope Borough Department of Wildlife Management since the mid-1980s (Dronenberg et al. 1986; George et al. 1988). These counts are corrected for whales missed by the observers, in particular through the use of acoustic arrays that detect the location of vocalizing whales (Zeh et al. 1993; George et al. 2004a, George et al. 2013; Givens et al. 2013; Givens et al. 2016.). These counts continue to be the primary source of abundance information for this stock though aerial surveys have produced a second estimate using photo-identification mark-recapture methods in spring (Koski et al.2010), and one minimal estimate using line-transect methods in autumn (Ferguson et al. 2017). At the meeting of the IWC’s Scientific Committee in April/May 2018, a revised estimate for the stock was presented; this new estimate will be considered in the Final EIS for bowhead whales.

The last ice-based survey was conducted in 2011 (Givens et al., 2016). Correcting the count of 4,011 observed whales yielded an abundance estimate of 16,820 bowhead whales with a 95% confidence interval of 15,176 to 18,643, and an estimated annual rate of population increase of 3.7% (95% CI = 2.9%, 4.6%) (**Fig. 3.2.1-1**). An aerial photographic survey was conducted near Point Barrow concurrently with the ice-based spring census in 2011; these data were analyzed to produce an abundance estimate based on sight-re-sight data (Givens et al., 2017). The estimated abundance was 27,133 (CV=0.217, 95% CI = 17,809 to 41,337). Although much less precise than the ice-based abundance estimate, the photo-identification estimate provides independent support to the evidence that the stock is abundant and increasing from previous years. At its 2018 meeting, the IWC’s Scientific Committee stated that the abundance estimate from the photo-id capture-recapture study is suitable for providing management advice and for use in the bowhead strike limit algorithm (2018 IWC Scientific Committee Report at 18).

The photo-identification data were also used to estimate bowhead survival rates. By comparing images from 1985, 1986, 2003, 2004, 2005 and 2011, estimated survival was 0.996 (lower bound = 0.976) which is consistent with previous estimates and with research showing that bowheads exhibit great longevity (up to 200 years old) (George et al. 1999, Rosa et al. 2013). Given the uncertainty of conducting a spring ice-based census in a warming Arctic (Suydam and George, 2017), an initial attempt was made to estimate abundance using aerial line-transect data collected in August 2016 (Ferguson et al., 2017).

The most recent point estimate of abundance for 2011 is 16,820 animal (Givens et al. 2016) and is between 73 and 162 percent of the estimated abundance prior to the onset of commercial whaling in the mid-nineteenth century, estimated at 10,400-23,000 (Woodby and Botkin 1993; see also Bockstoce et al. 2005). Schweder et al. (2009) estimated a yearly growth rate of 3.2 percent between 1984 and 2003 based on these data from aerial surveys. Using all ice-based abundance survey estimates from 1978 to 2011, Givens et al. (2016) estimate a yearly growth rate of 3.7% (95% CI = 2.9% to 4.6%). Although recent abundance estimates suggest population level that are as high as or higher than prior estimates of carrying capacity (K), the population growth rate shows no sign of slowing (Givens et al. 2016).

Genetics. Rooney et al. (2001) analyzed patterns of genetic variability among bowhead whales. Samples were taken from whales from the northern coast of Alaska, and from whales landed on St. Lawrence Island in the Bering Sea. The results of the research indicated that there was no genetic bottleneck (an evolutionary event that occurs when a population is reduced to a level insufficient to maintain diversity) in the Western Arctic stock and that the level of genetic variability has remained relatively high (nucleotide diversity = 1.63%) in spite of the depletion of the stock by commercial whalers in the 1800s. The stock reached its lowest abundance around 1914, when commercial whaling ceased; it is estimated that at that time there were 1,000 to 3,000 bowhead whales in the stock (Woodby and Botkin 1993).

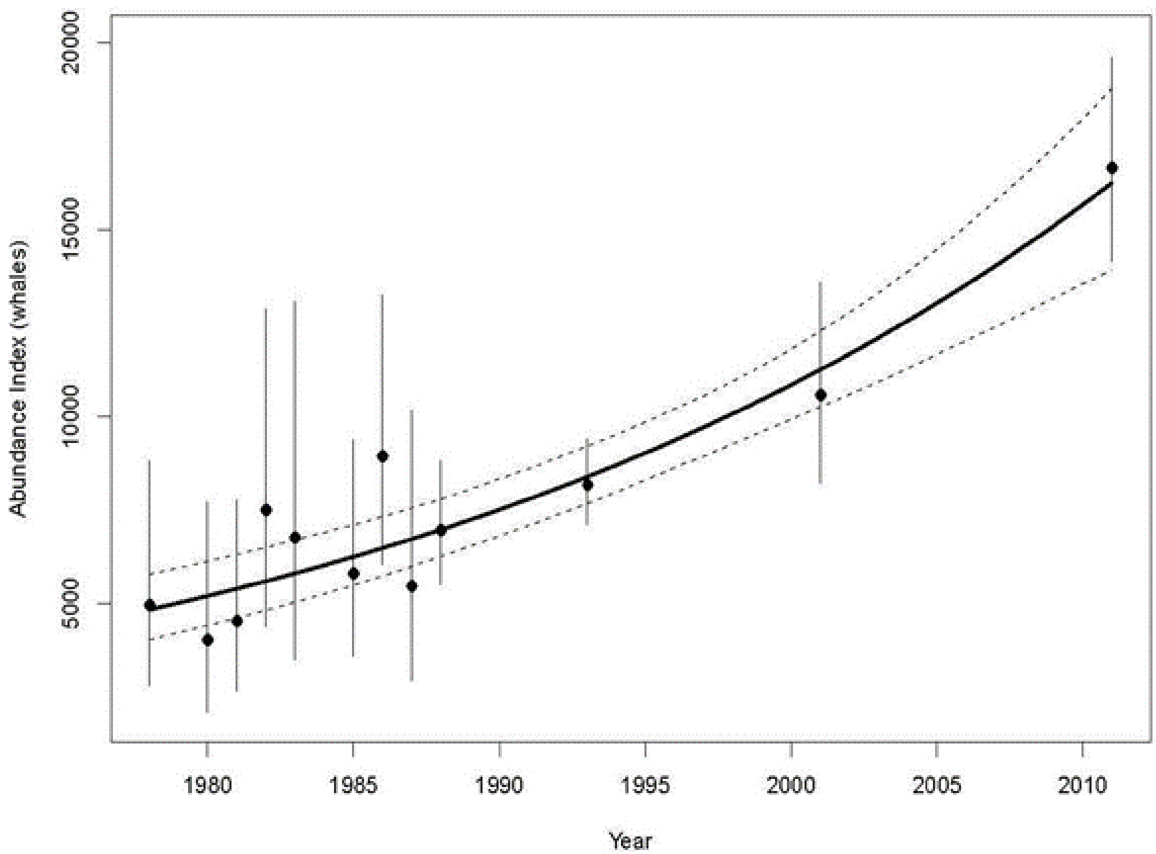


Figure 3.2.1-1. Abundance estimates for the Western Arctic stock of bowhead whales, 1978-2011 (Givens et al. 2016), as computed from ice-based counts and associated acoustic data collected during bowhead whale spring migrations past Point Barrow, Alaska.

Comparisons between the Western Arctic stock and the Okhotsk Sea stock showed a much greater haplotypic[16] diversity (0.93) in the Western Arctic samples than in the Okhotsk Sea samples (0.61). Analyses of microsatellite and sequence data revealed significant genetic differences between the two populations, indicating that the populations represent discrete gene pools (LeDuc et al. 2005). These differences indicate that the two populations should be considered genetically and demographically separate for management purposes; geneflow between them is negligible at most. The results also seem to parallel those for gray whales (LeDuc et al. 2002), another North Pacific species with a large eastern population showing high diversity and a small western population with considerably lower diversity.

Taylor et al. (2007) examined the plausibility of multiple bowhead whale stocks in the Western Arctic population. They synthesized four lines of evidence that related to understanding stock structure:

(1) Movement and distribution;
(2) Basic biology;
(3) History of commercial whaling; and
(4) Interpretation of genetic patterns.

The paper reviewed 30 years of research plus contributions from TEK. In terms of bowhead biology, bowhead whales have adapted to living in an arctic ecosystem where ice coverage and food resources vary through time. Taylor et al. (2007) concluded that this varying environment makes both the evolutionary reason for multiple breeding stocks within the Bering Sea and the biological feasibility of maintaining separation within a relatively small pelagic area unlikely. There is variability in the timing that individual bowhead whales migrate, in the timing of the peak of the migration itself, and in the location of both summering and wintering grounds. The variation is a result of both changing environmental conditions and changes in the whales' age and reproductive state. Furthermore, the available area for any potential segregation of feeding or breeding groups is well within the ability of individual whales to travel in a few days' time. There is no evidence of a possible small discrete stock within the Western Arctic bowhead population. If there is, it is highly unlikely that any are present and harvested during the spring

[16] Haplotypic diversity is a measure of the genetic variation between individuals or populations and is one way to describe the degree of relatedness between them. Most organisms have two sets of chromosomes (diploidy), one set inherited from each parent. Thus, different versions of each gene (alleles) may be present (Aa, Bb, Cc, etc.). The haplotype describes the genes on one set (ABC). Populations may have several haplotypes, or combinations of different alleles (ABC, ABc, AbC, etc). Comparison of haplotypes between populations is typically done by examining mitochondrial DNA, which is inherited from one parent only (mother), counting the number of differences in the nucleotide base pairs between them. This is used to calculate haplotypic diversity (h). High values, as in this case, indicate that the populations may be genetically distinct.

or autumn migration of Western Arctic bowhead whales. No data were found to support risk to a separate feeding group. Other insights using genetic data were weak, but nearly all results were consistent with a single stock that is out of genetic equilibrium following commercial depletion. Bowhead whales being out of genetic equilibrium was supported by differences found between age cohorts, both in empirical data and simulated data. The only significant genetic findings worth further consideration were differences involving whales taken from waters off St. Lawrence Island when compared with those landed at Utqiaġvik (Barrow). However, the comparisons that were significant involved small sample sizes and can be explained by genetic patterns found between different age cohorts (LeDuc et al. 2008). At the 2007 IWC meeting in Anchorage, Alaska, the IWC Scientific Committee Sub-Committee on Bowhead, Right and Gray Whales concluded after a three year investigation of the stock structure of the Bering-Chukchi-Beaufort population of bowhead whales, as summarized in Taylor et al. (2007), that the available evidence best supports a single-stock hypothesis for Western Arctic bowhead whales (IWC 2007:7). Updated data and new genetic markers were evaluated in 2018 (Baird et al. 2018).

Status and Management. Since 1931, bowhead whales have been protected from commercial whaling internationally, first under the League of Nations Convention, and since 1949 by the International Convention for the Regulation of Whaling (ICRW). Under the IWC, an important feature of the convention is the emphasis it places on scientific advice. The ICRW requires that amendments to the Schedule 'shall be based on scientific findings.' To address this requirement, the Commission established a Scientific Committee in 1950. The Scientific Committee is now comprised of more than 200 of the world's leading whale biologists, many of whom are nominated by IWC member governments. In addition, in recent years, the Scientific Committee has invited other scientists to supplement its expertise in various areas. The size of the Scientific Committee, as well as the subject matter it addresses, has increased considerably over time. In 1954, it comprised 11 scientists from seven member nations. The Scientific Committee is one of four Committees established by the Commission, the others being the Finance and Administration Committee, the Technical Committee and the Conservation Committee. Formally, the Scientific Committee reports directly to the Commission.

The IWC Schedule establishes in paragraph 13(a) the following principles to be followed by IWC member nations for setting aboriginal subsistence whaling catch limits: (1) for stocks above the Maximum Sustainable Yield (MSY) level, aboriginal subsistence catches shall be permitted so long as total removals do not exceed 90% of MSY; (2) for stocks below MSY level, but above a certain minimum level, aboriginal subsistence catches shall be permitted so long as they are set to allow stocks to increase to the MSY level; (3) catches will be kept under review; (4) for bowheads, it is forbidden to strike, take, or kill calves or any whale accompanied by a calf; (5) all aboriginal whaling shall be conducted under national legislation that accords with paragraph 13 of the Schedule; (6) strike/catch limits shall be automatically renewed provided three conditions in Schedule paragraph 13(a)(6) are met; and (7) the provisions for each stock identified in Schedule paragraph 13(b), especially the provisions for carryover, shall be reviewed by the Commission in light of the advice of the Scientific Committee. In addition, the IWC Scientific Committee advises the IWC on a range of rates of increase to the MSY level. Prior to 2003, to achieve the goals of the principles set forth in paragraph 13(a), the IWC assessed aboriginal whale harvests under various catch control rules. The most important reference point for these rules was replacement yield (RY), which refers to the number of animals that could be killed while leaving the population the same size at the end of the year as at the beginning of the year.[17] Although the catch control rules varied somewhat during the decade, they shared a common strategy: RY would be statistically estimated from population dynamics models and available data, and a lower confidence bound for RY, or a function of it, was taken to be a safe harvest level (IWC, 1999). During this period, the lower bound (5th percentile) for RY was estimated to be more than 100 whales. For example, in 1998, the IWC Scientific Committee estimated that the population "appears to be near MSY, and would very likely increase under catches of up to 108 animals" (IWC, 1999). While the IWC Scientific Committee agreed that such a harvest level satisfied the principles for setting catch limits under sub- paragraph 13(a) of the IWC Schedule, the quota and the annual number of whales landed and struck has always fallen well below this number (**Figure 3.2.1-2**).

In 2003, the IWC replaced the practice of setting quotas based on RY with a new procedure relying on the "Bowhead Strike Limit Algorithm" (Bowhead SLA) it had adopted for setting the quota for Western Arctic bowhead whales (IWC 2003a,b). The algorithm requires as inputs the past history of strikes taken, the desired number of strikes for the next quota block, and periodic estimates of bowhead population abundance. Using those inputs, the Bowhead SLA calculates whether the desired strike level meets conservation objectives. To ensure that the Bowhead SLA maintains safe strike limits, the IWC Scientific Committee tested the algorithm under a very large number and variety of scenarios using thousands of computer simulations with mathematical models of whale population dynamics, future data, external factors, and potential management. These scenarios incorporated factors including, but not limited to, stock structure, changes in carrying capacity, episodic events resulting in mass mortality, survey bias, and changes in biological parameters (cf. 2003 IWC Scientific Committee Report, and its annexes for a complete list of evaluation and robustness trials conducted when evaluating the appropriateness of the Bowhead SLA). The simulation-testing framework explicitly considered uncertainty in these population simulations and sought to ensure that the Bowhead SLA would meet IWC

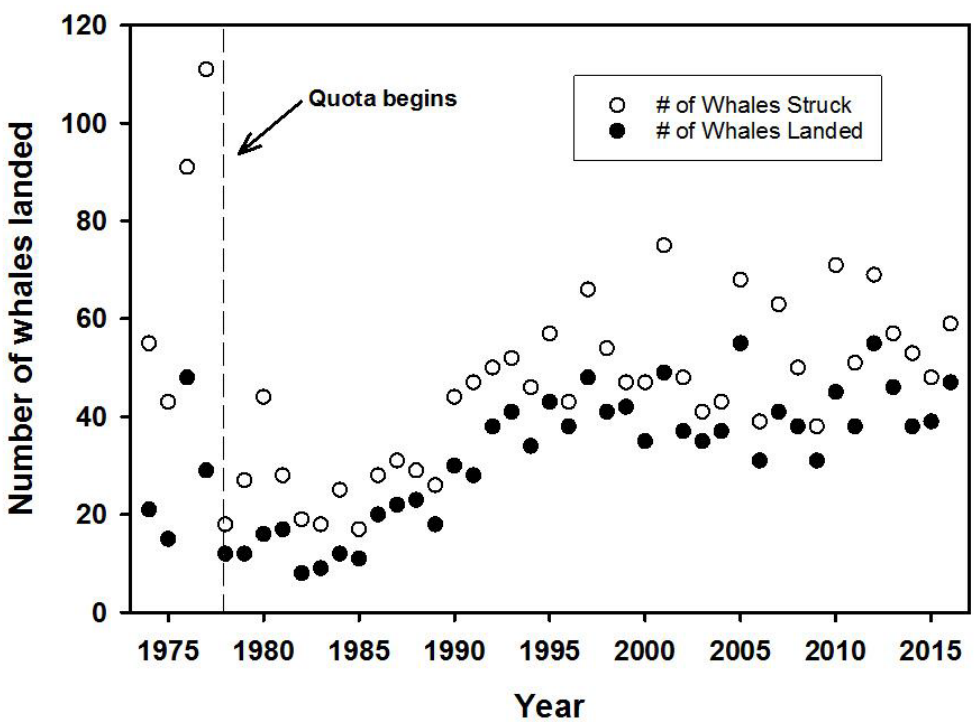
[17] Another catch control rule, designated Q, was developed to give an appropriate catch limit across any population level to meet the principles set forth in IWC Schedule paragraph 13(a) (Wade and Givens, 1997). The catch control rule Q allows the proportion of net production allocated to recovery to increase as a population becomes more depleted and decrease for a population above MSY and approaching K. For populations above the MSY level, Q is capped at 90% of MSY, as required by IWC Schedule paragraph 13(a). In 2006, the best estimate of Q was determined to be 257 bowhead whales (range: 155-412 animals; Brandon and Wade, 2006). (See **Section 4.1.2** on the use of Q for helping to evaluate the level of impact of Alternative 5.)

objectives for the management of stocks subject to aboriginal subsistence takes (cf. IWC, 1999), which are to:

(1) Ensure that the risks of extinction to individual stocks are not seriously increased by subsistence whaling;
(2) Enable aboriginal people to harvest whales in perpetuity at levels appropriate to their cultural and nutritional requirements, subject to the other objectives; and
(3) Maintain the status of stocks at or above the level giving the highest net recruitment and to ensure that stocks below that level are moved towards it, so far as the environment permits[18].

In addition to the principles that must be followed in setting catch limits, the IWC Schedule, as adopted in 2018, also identifies specific catch limits for 2019 through 2025, with a provision for automatic renewal. (See **Sections 1.2.2 and 2.0**.)*(ii)This provision shall be reviewed annually by the Commission in light of the advice of the Scientific Committee.*

The IWC Scientific Committee has confirmed that these limits are safe according to the Bowhead SLA. It is important to note that the annual number of bowhead whales landed and struck and lost has always fallen below these specific catch limits (**Figure 3.2.1-2**).



[18] Note that the statement of these stock management objectives differs from, but is consistent with, the aboriginal subsistence whaling management principles of Schedule paragraph 13(a).

Figure 3.2.1-2. Annual number of Western Arctic bowhead whales landed and struck by Alaska Native villages in Alaska, 1998-2016**.**

Inuit in Alaska have been taking bowhead whales for at least 2,000 years (Marquette and Bockstoce, 1980; Stoker and Krupnik, 1993), and subsistence takes have been regulated by a management system under the authority of the IWC since 1977. Yet with a subsistence take that averages between 40 to 50 strikes per year, the Western Arctic stock has continued to grow 3.74% annually, adding roughly 623 bowhead whales to the population in 2011 (0.0374 x 16,820 whales) and likely similar numbers annually since then. Considered in light of the most recent population estimate of 16,820 whales (95 percent CI: 15,176 to 18,643) from 2011 (Givens et al. 2016), this level of subsistence take represents 0.3 percent of the 2011 population, and likely even less than the current population, if continued annual population growth of 3.7 percent is assumed.

The Western Arctic stock of bowhead whales remains listed as endangered under the Endangered Species Act (ESA); because of the ESA listing, the stock is classified as a depleted and a strategic stock under the Marine Mammal Protection Act (MMPA). Nonetheless, it is important to note that the Western Arctic bowhead whale population has continued increasing in abundance, while being affected by a managed hunt. Further, estimated abundance is now so high that it exceeds most past estimates of carrying capacity (K).

General Migration Pattern. The Western Arctic stock occupies seasonally ice-covered waters of the Bering, Chukchi, and Beaufort seas (Moore and Reeves, 1993). Most bowheads winter in the Bering Sea, in continental shelf waters north of the southern boundary of sea ice (Moore and Reeves, 1993; Citta et al., 2012). In March and April, whales begin to migrate north into the Chukchi Sea, most following leads (openings in the sea ice) along the Alaska coastline (**Fig. 3.2.1-3**). As they pass Point Barrow, they continue east crossing the Beaufort Sea to an area near Cape Bathurst in Amundsen Gulf, Canada, where they summer (Quakenbush et al., 2012, 2013). Whales migrate past Point Barrow from April into June. A few whales migrate westward along the Chukotka coast and may remain in the Chukchi Sea all summer (e.g., Melnikov and Zeh, 2007) although there is evidence that individual whales my vary their migration routes and summer distribution from year to year (Citta et al. 2012). Whales in the Canadian Beaufort Sea begin to migrate west in August, generally paralleling the coastline to Point Barrow. The westbound migration continues through October. From Point Barrow, whales cross the Chukchi Sea to the Chukotka coast and continue south. By the end of December, most bowhead whales have returned to the Bering Sea (Quakenbush et al. 2010; Citta et al. 2012).

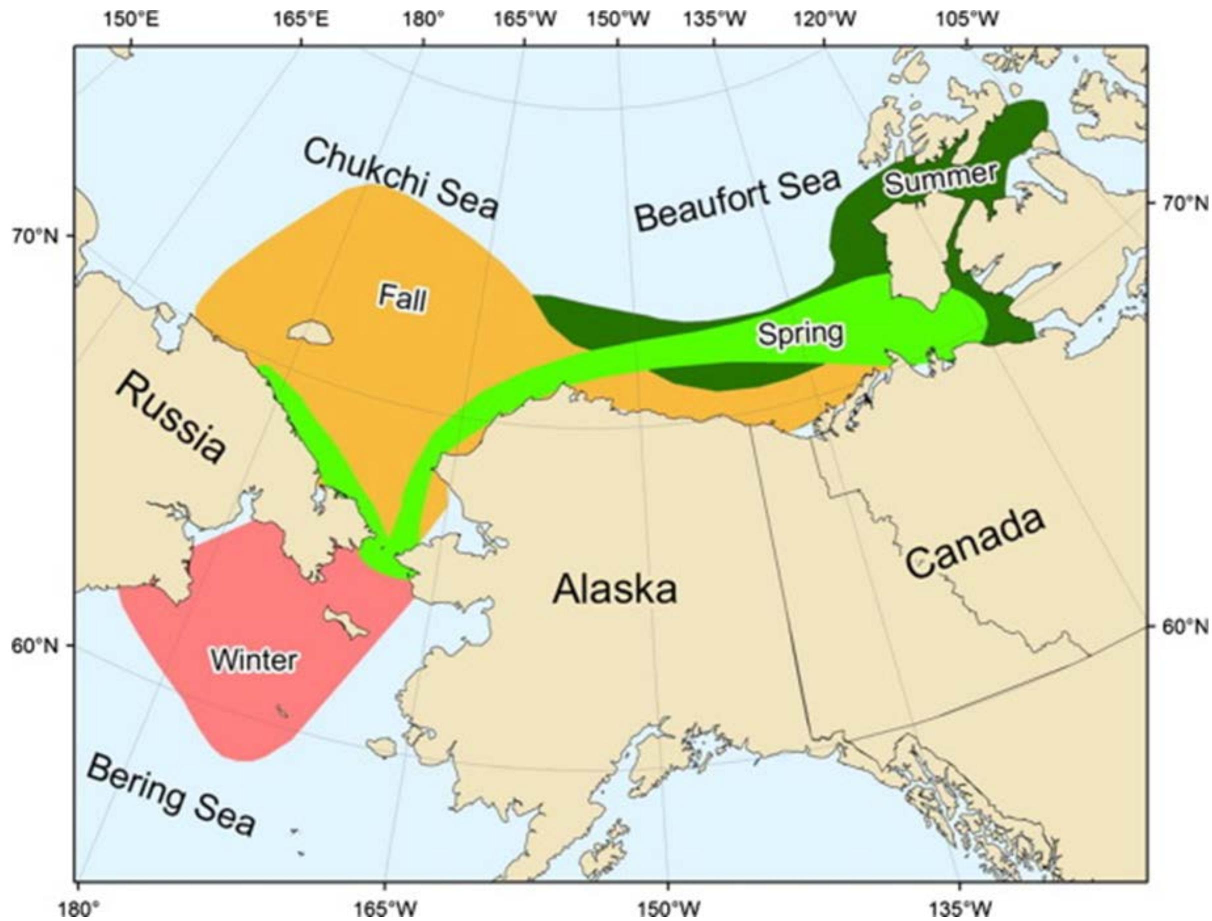


Figure 3.2.1-3. Range map for Western Arctic bowhead whales based on satellite telemetry data. Source: Quakenbush et al 2012.

Bowhead Core Use Areas. Citta et al. (2015) used locations from 54 satellite-tagged bowhead whales to define areas of concentrated use, termed "core-use areas", for Western Arctic whales that summered in the eastern Beaufort Sea (**Fig. 3.2.1-4**). They linked use of these areas to potential prey of these whales as follows: "In spring, most whales migrated from wintering grounds in the Bering Sea to the Cape Bathurst polynya, Canada (Area 1), and spent the most time in the vicinity of the halocline at depths <75 m, which are within the euphotic zone, where calanoid copepods ascend following winter diapause. Peak use of the polynya occurred between 7 May and 5 July; whales generally left in July, when copepods are expected to descend to deeper depths. Between 12 July and 25 September, most tagged whales were located in shallow shelf waters adjacent to the Tuktoyaktuk Peninsula, Canada (Area 2), where wind-driven upwelling promotes the concentration of calanoid copepods. Between 22 August and 2 November, whales also congregated near Point Barrow, Alaska (Area 3), where east winds promote upwelling that moves zooplankton onto the Beaufort shelf, and subsequent relaxation of these winds promoted zooplankton aggregations. Between 27 October and 8 January, whales congregated along the northern shore of Chukotka, Russia (Area 4), where zooplankton likely concentrated along a coastal front between the southeastward-flowing Siberian Coastal Current and northward-flowing Bering Sea waters. The two remaining core-use areas occurred in the Bering Sea: Anadyr Strait (Area 5), where peak use occurred between 29 November and 20 April, and the Gulf of Anadyr (Area 6), where peak use occurred between 4 December and 1 April; both areas exhibited highly fractured sea ice. Whales near the Gulf of Anadyr spent almost half of their time at depths between 75 and 100 m, usually near the seafloor, where a subsurface front between cold Anadyr Water and warmer Bering Shelf Water presumably aggregates zooplankton. The amount of time whales spent near the seafloor in the Gulf of Anadyr, where copepods (in diapause) and, possibly, euphausiids (small, shrimp-like crustaceans) are expected to aggregate provides strong evidence that bowhead whales are feeding in winter. The timing of bowhead spring migration corresponds with when zooplankton are expected to begin their spring ascent in April. The core-use areas we identified are also generally known from other studies to have high densities of whales and we are confident these areas represent the majority of important feeding areas during the study (2006–2012).

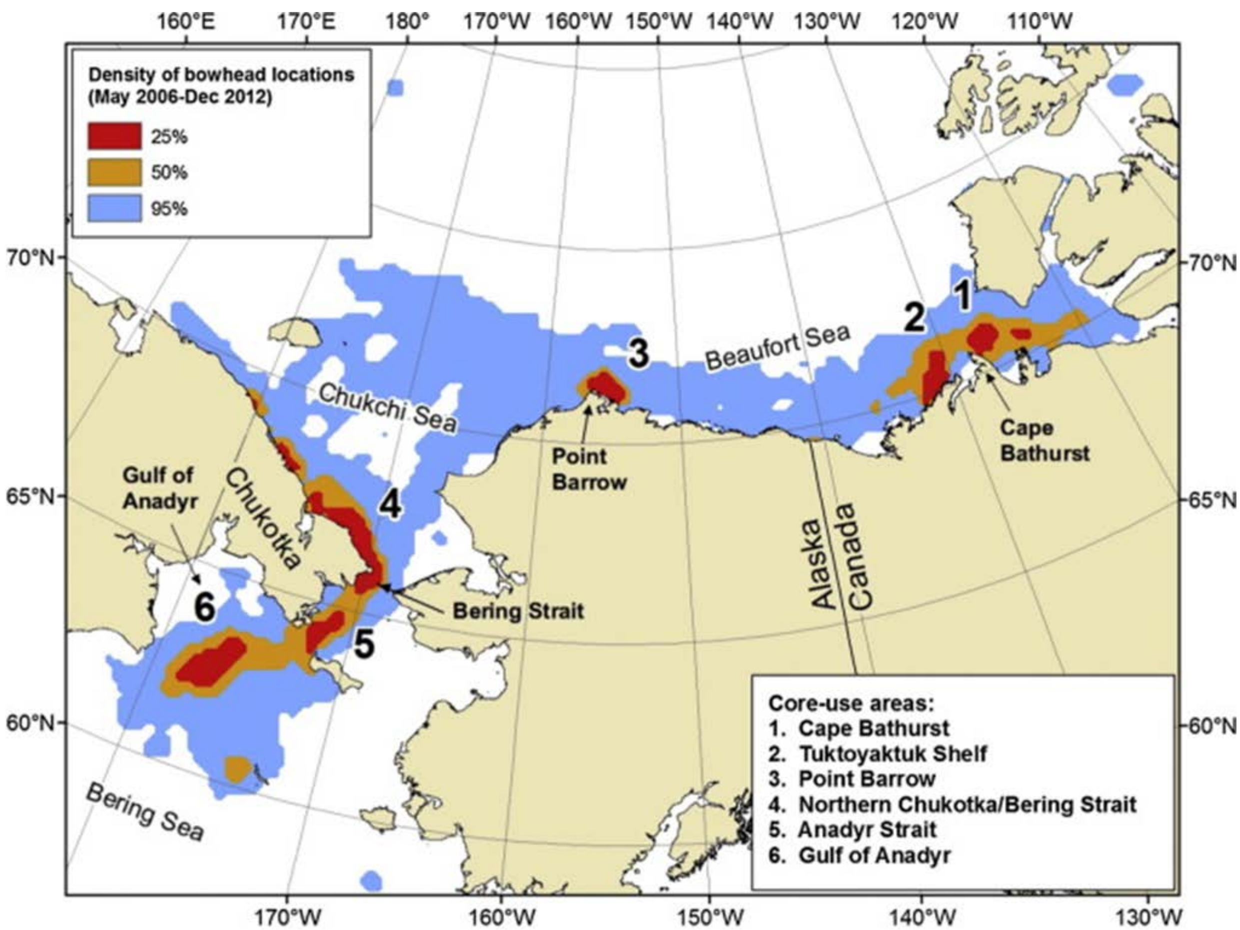


Figure 3.2.1-4. Seasonal core-use areas of Western Arctic bowhead whales (n = 54) tagged with satellite transmitters (2006-2011). Source: Citta et al., (2015).

Segregation by Size and Sex. During the spring migration, temporal segregation by size class and sex occurs in three overlapping pulses, the first consisting of sub-adults, the second of larger whales, and the third composed of even larger whales and cows with calves (Nerini et al., 1987; Rugh, 1990; Angliss et al., 1995; Suydam and George, 2004). However, more recently, these pulses are less distinguishable, possibly due to the increase in the population size or changing ice conditions in the Chukchi Sea or both. Along the Chukchi Peninsula, Russian Chukotkan Natives noted the appearance of mothers with calves in late-March and early April followed by immature and adult animals (Bogoslovskaya et al., 1982). In the Beaufort Sea in summer, aggregations have usually consisted of only juveniles or of large whales that may include calves (Richardson, 1987; Davis et al., 1986). In 1983, Cubbage and Calambokidis (1987) found a significant inverse correlation between longitude and size class; rates of encounter for larger whales increased moving west to east in the Beaufort Sea. Onshore and offshore distributions varied annually, suggesting that sex- or age-class segregation patterns are temporally and spatially fluid and cannot be defined rigidly for any region or period (Moore and Reeves, 1993). Segregation by size also occurs during the autumn migration (Braham, 1995; Suydam and George, 2004). George et al. (1995) showed a clear trend in progressively smaller whales harvested between August and November. Along the Chukchi Peninsula, the autumn migration splits into two pulses (Bogoslovskaya et al., 1982; Mel'nikov and Bobkov, 1993, 1994), though segregation by size class or sex was not confirmed as the cause.

3.2.2 Commercial Whaling

Bowheads were first commercially hunted in the Bering Sea in 1848, and in the following year more than 40 vessels took part in the hunt. By 1852, more than 200 ships were cruising in the Bering Strait region and fully one-third of all commercial catches had been made, rapidly reducing the stock (Bockstoce and Botkin 1980). Total catches were quite variable during the early years of commercial whaling. After low catches in 1853 and 1854, the fleet abandoned the Bering Strait and arctic grounds for the Okhotsk Sea grounds in 1855, 1856, and 1857. As hunting continued and the population was reduced, the whalers went farther and farther north and east. After almost eradicating the Okhotsk Sea population, the fleet returned to the Bering Strait in 1858, remaining there and farther north for the next half-century. In 1889, steamships reached the summer feeding grounds off the Mackenzie River Delta, Canada, which remained the major focus of the industry until 1914, about the time that commercial whaling collapsed (Bockstoce and Botkin, 1980; Bockstoce et al., 2007).

3.2.3 Subsistence Hunts

Inuit in Alaska have been taking bowhead whales for at least 2,000 years (Stoker and Krupnik, 1993). Although early historical records were not kept, it is estimated that Alaska Natives may have taken 20 whales per year (Ellis, 1991). Subsistence hunting is not a new contributor to cumulative effects on this population. There is no indication that, prior to commercial whaling, subsistence whaling caused significant adverse effects at the population level (Minerals Management Service [MMS], 2006a:201).

Subsistence takes have been regulated by catch limits under the authority of the IWC since 1977. The annual number of bowheads landed by Alaska Natives has ranged from 8 (in 1982 as a result of IWC setting a lower catch limit) to 55 (in 2005 and 2012) from the time records were first kept in 1973, while bowheads struck and lost have ranged from 5 (in 1999) to 82 (in 1977) (**Figure 3.2.3-1**). Hunters from the western Canadian Arctic community of Aklavik killed one bowhead whale in 1991 and one in 1996, though Canada is not a member of the IWC and thus harvests in Canada are not approved by the IWC. As part of the shared quota with the Russian Federation, one bowhead whale was killed by Russian subsistence hunters in each of 1999 (IWC, 2001a; 2002), 2000 (IWC, 2002), and 2001 (IWC, 2003c), three in 2002 (IWC, 2004) and 2003 (IWC, 2005b), one in 2004 (IWC, 2006a), two in 2005 (IWC, 2007), none in 2006 (IWC, 2008b) and 2007 (IWC, 2009a), two in 2008 (IWC, 2010c), none in 2009 (IWC, 2011a), two in 2010 (IWC, 2012a), none in 2011(IWC 2012b) and 2012 (Ilyashenko 2013), one in 2013 (Ilyashenko and Zharikov 2014), none in 2014 and 2015 (Ilyashenko and Zharikov 2015, 2016), two in 2016 (Ilyashenko and Zharikov 2017), and one in 2017 (IWC/67/WKM&WI/01 Summary of Activities Related to the Action Plan on Whale Killing Methods (based on Resolution 1999-1). (Figure 3.2.4-1). Descriptions of the Alaska hunts and their management are provided in Sections 3.4 and 3.5, respectively.

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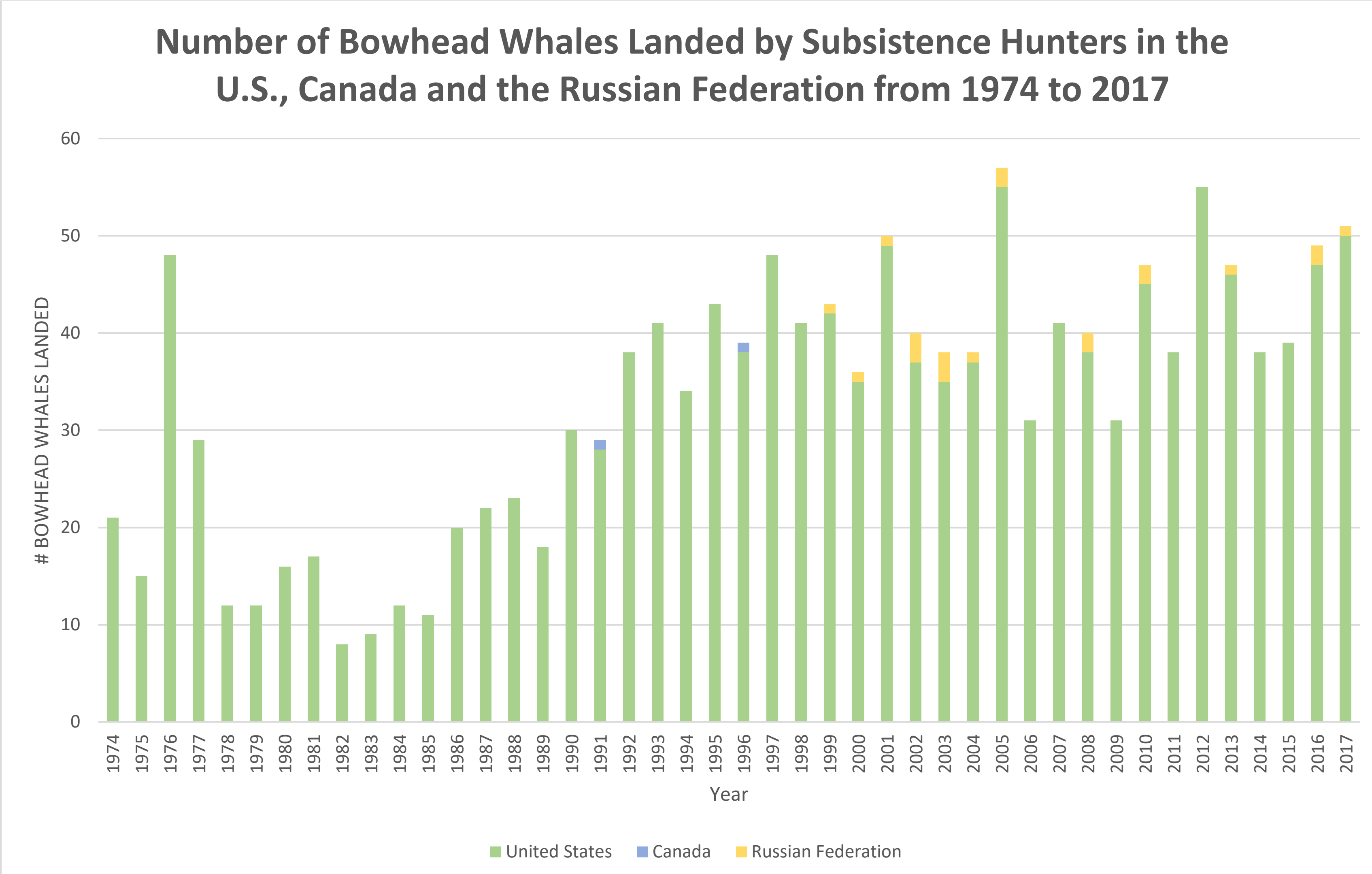

Figure 3.2.3-1. Number of bowhead whales landed by subsistence hunters in the U.S., Canada and the Russian Federation, 1974-2017. Sources: Suydam et al. 2018; IWC/67/WKM&WI/01 Summary of Activities Related to the Action Plan on Whale Killing Methods (based on Resolution 1999-1).

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3.2.4 Natural Mortality

There is still a great deal to learn about naturally occurring diseases and death in bowhead whales (e.g., Heidel and Albert, 1994). Studies of harvested bowhead whales have discovered bacterial, mycotic, and viral infections but not at a level that might contribute to mortality and morbidity (Philo et al., 1993). Skin lesions, found on all harvested bowhead whales, were not malignant or contagious. However, potentially pathogenic microorganisms inhabit these lesions and may contribute to epidermal necrosis and the spread of disease (Shotts et al., 1990). Exposure of these roughened areas of skin to environmental contaminants, such as petroleum products, could have detrimental effects (Albert, 1981; Shotts et al., 1990); Bratton et al. (1993), however, concluded that such encounters were not likely to be hazardous.

The few infectious disease surveillance studies that have been conducted on bowhead whales indicate that a limited suite of infectious agents are present that could impact bowhead health or pose a public health risk (Philo et al. 1992; O'Hara et al 1998; Hughes-Hanks et al. 2005; Stimmelmayr 2015). Results from recent infectious disease surveillance studies in general corroborate previous findings (Stimmelmayr et al 2018). Tissue samples of major visceral organs collected from 61 landed bowhead whales (2011-2015) were analyzed for a suite of high priority marine mammal pathogens (Venn-Watson et al. 2010) by the University of Georgia. The only viral agent detected in 9.8% (6/61) bowhead whales belonged to the group of adenoviruses which Smith et al (1987) previously had reported upon. No lesions were associated with adeno virus presence. Molecular characterization identified several distinct genotypes and these data will be included in a draft manuscript to be completed in 2018 that will report on these findings in bowhead whales.

Endoparasites. Previous surveillance for endoparasites in subsistence-harvested bowhead whales demonstrated a limited suite of internal parasites, most likely reflecting the dietary habits of bowhead whales, and the presence of potential zoonotic protozoa (for review Philo et al. 1992; Hughes-Hanks et al. 2005). Recently feces (n=159) collected from landed bowhead whales during 2002 to 2015 were analyzed by University of Colorado (Stimmelmayr et al 2018) for helminths and protozoa. Cryptosporidium was absent in contrast to previous studies but marked interannual variation of *Giardia* spp. prevalence was observed. Prevalence ranged from 0 to 100 %. Molecular characterization of *Giardia* identified assemblages attributed most commonly to human hosts. These data will be included in a draft manuscript to be completed in 2018 that will report on temporal trends of protozoa prevalence and *Giardia* assemblages identified in these cetaceans.

Few macroparasites (e.g. *anisakis, crassicauda* spp.) occur in bowhead whales (Sheffield et al 2016; Stimmelmayr et al. 2018a). Recent molecular studies to further characterize nematodes to species level were inconclusive for *Anisakis* spp (Stimmelmayr unpubl.data) and *crassicauda* spp

(Stimmelmayr et al. 2018b). Morphological and molecular studies are ongoing to further refine *crassicauda* and *anasakis* species identification.

Lesions. Neoplastic lesions in bowhead whales continue to be rare. However, benign fatty masses (lipomas; myelolipomas) of the liver, first seen in 1980 (Migaki and Albert 1982), have been annually observed in 1-2 landed bowhead whales in Utqiaġvik (Barrow) per year since 2012; Stimmelmayr et al 2017). The pathogenesis and exact cell origin of these benign fatty tumors in bowhead whales are undetermined, but lesions appear to not be associated with other significant disease in examined bowhead whales.

Evidence of ice entrapment and predation by killer whales (*Orcinus orca*) has been documented in almost every bowhead whale stock. The percentage of whales entrapped in ice is considered to be quite small, likely because this species is strongly ice-associated (Tomilin, 1957; Mitchell and Reeves, 1982; Nerini et al., 1984; Philo et al., 1993). The ice may also provide some protection from killer whale attacks. Transient killer whales are the only known predators of bowhead whales. In a study of marks on bowhead whales taken in the subsistence harvest between spring 1976 and fall 1992, 4.1% to 7.9% had scars indicating that they had survived attacks by killer whales (George et al. 1994). Of 378 complete records for killer whale scars collected from 1990 to 2012, 30 whales (7.9%) had scarring “rake marks” consistent with killer whale injuries and another 10 had possible injuries (George et al., 2017). The frequency of killer whale scars was much higher (> 40%) on whales more than 16 meters in length and statistically more frequent in the second half of the study (2002 – 2012), suggesting killer whale predation is increasing. George et al. (2017) noted this may be due to better reporting and/or sampling bias, an increase in killer whale population size, an increase in occurrence of killer whales at high latitudes (Clarke et al., 2013), or a longer open water period offering more opportunities to attack bowhead whales. Note that this rate of scarring should not be interpreted as the rate of attack by killer whales because carcasses from successful killer whale attacks are unlikely to be observed or recovered. At least 2 of 10 bowhead whale carcasses observed during the Aerial Survey of Arctic Marine Mammals (ASAMM) project in 2015 had evidence of killer whale predation (rake marks, missing jaw/tongue) (George et al., 2017).

3.2.5 Contaminants

A number of organochlorine contaminants persist in the Arctic marine environment, including but not limited to polychlorinated biphenyls (PCBs), and dichlorodiphenyltrichloroethanes (DDTs). However, very limited data are available on baseline organochlorine concentrations in prey or tissues of bowhead whales and on the normal biochemical and histologic (microscopic) determinants used to assess exposure and impacts. Organochlorines (OCs) are ubiquitous, persistent contaminants and are lipophilic (fat loving) and tend to bioaccumulate in lipid-rich tissues (i.e., blubber). Recent analyses were presented at a bowhead health and physiology workshop held in Utqiaġvik (Barrow), Alaska, in 2002 (Willetto et al., 2002). OC concentration levels varied from the Bering-Chukchi-Beaufort seas suggesting that contaminant levels varied along the migratory range of the bowhead whale (Hoekstra et al., 2002a). The OC levels consistently fluctuated with seasonal migration between the Beaufort and Bering seas over a 3.5-year period, indicating that active feeding must be occurring in both areas to alter contaminant levels and profiles in tissues (discussed in Willetto et al., 2002).

Approximately 350 high quality blubber samples from bowhead whales were analyzed for lipid content, and the proportion of neutral lipids (i.e., triglycerides, non-esterified free fatty acids) that are key factors affecting the accumulation of lipophilic OCs (discussed by Ylitalo in Willetto et al., 2002). Lipid concentrations of bowhead blubber ranged from 25% to 83%, primarily comprised of triglycerides (94% to 100%). The mean lipid concentrations were significantly different among the three collection years (1998, 1999, and 2000) and by season (autumn versus spring) (discussed by Zeh in Willetto et al., 2002). Blubber and liver samples were analyzed for selected OCs (toxaphene (TOX), PCBs, DDTs, hexachlorocyclohexanes (HCHs), chlordanes, and chlorobenzenes) to investigate bioaccumulation and biotransformation (Hoekstra et al., 2002a, b). In general and as expected, concentrations of OCs significantly increased with body length in male bowhead whales (Hoekstra et al., 2002a). Concentrations also increased with body length (e.g., age) in female whales but only up to the length of 13 m, the approximate length of sexual maturity. Adult females (greater than 13 m) had generally lower concentrations than juvenile whales, which was attributed to the transfer of OCs from mother to young during gestation and lactation.

Geographic differences in contaminant exposure and accumulation (contamination varied by region) were reflected in OC concentrations in blubber of the bowhead whale, which was very likely a result of feeding in the respective regions, i.e., the Bering and Beaufort seas (Hoekstra et al., 2002a). Age, gender, and concentration levels influence PCB biotransformation (Hoekstra et al., 2002b). The sum of PCB concentrations in bowhead whales was relatively low compared to levels found in other cetaceans.

Heavy metal concentrations (i.e., cadmium [Cd], mercury [Hg], selenium [Se]) increased with age and tended to be relatively high in Arctic marine mammals; however, Hg and Se were comparably low in bowhead whales (Woshner et al., 2001, 2002; O'Hara et al., 2006).

Recently, archived blubber and muscle samples collected from subsistence harvested male bowhead whales [whales harvested in Utqiaġvik (Barrow), Alaska in 2006 – 2015] were analyzed for persistent organic pollutants (POPs) by the NWFSC (Seattle, WA). The most abundant POPs determined in the bowhead tissue samples were PCBs, with mean concentrations ranging from 60 to 140 ng/g in blubber. Blubber concentrations of PCBs and DDTs determined in male bowhead whales sampled in 2015 were at least four times lower than those reported by

O'Hara et al. 1999 in male bowheads sampled in 1992/1993 (**see Figure 3.2.4-1**). These data will be included in a draft manuscript to be completed in 2018 that will report on contemporary levels of POPs in these cetaceans.

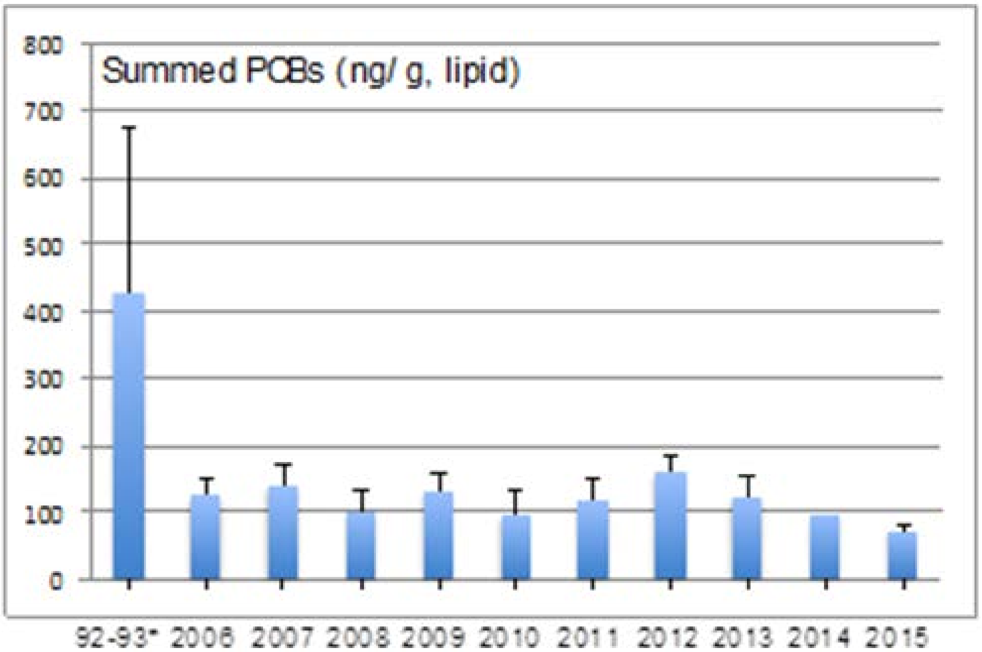

Figure 3.2.4-1. Blubber concentrations of PCBs and DDTs determined in male bowhead whales sampled in 1992 and 1993. Data from O'Hara et al. 1999.

In addition, blubber and muscle samples of these subsistence harvested male bowheads were also analyzed for petroleum-related polycyclic aromatic hydrocarbons (PAH). In general, the bowhead tissue concentrations of these compounds were low (< 50 ng/g, wet weight) and provide baseline PAH information for this Arctic species. These data will be included in a baseline PAH manuscript for subsistence-harvested Arctic marine mammals.

In summary, contaminant levels for bowhead whales varied by gender, length (i.e., age), and season, but most contaminants were relatively low compared to other marine mammals.

3.2.6 Fishery Interactions

The IWC's Scientific Committee has described bycatch as the most serious direct threat to cetaceans globally (https://iwc.int/bycatch, accessed 16 February, 2018). There is abundant evidence of bowhead whale entanglement in commercial fishing gear, probably pot gear (Philo et al. 1993, George et al. 2017). Most of this evidence derives from examination of scarring on subsistence caught whales or from aerial photographs of whales, but at least one bowhead has been found dead while entangled in crab pot gear from a U.S.-managed fishery (George et al.

2017). In 2017, two bowhead whales were harvested that were entangled in rope. Gear was consistent with crab pot gear (Stimmelmayr et al. 2018).

George et al. (2017) examined records for 904 bowhead whales harvested between 1990 and 2012. Of these, 521 records were examined for at least one of the three types of scars indicating injuries from line entanglement wounds (515 records). Their best estimate of the occurrence of entanglement scars was 12.1% (59/486; an additional 29 records with possible entanglement scars were excluded from the analysis) with the source of entanglement most likely attributable to commercial pot gear in the Bering Sea (crab and codfish pots). Based on multi-year photo mark-recapture data, the probability of a bowhead acquiring an entanglement injury was estimated at 2.4% per year (Givens et al. 2017, IWC SC/67a 2017 page 63) and about 50% of large (≥17m) bowheads harvested by subsistence hunters bore entanglement scars (George et al. 2017). Most entanglement injuries occurred on the peduncle and were rarely observed on smaller subadult and juvenile whales (<10 m). These estimates of entanglement due to evidence of scarring should be considered minimum estimates of entanglement rates, as they do not include those whales that may have become anchored in place by pot gear, or that died because of entanglement and were not subsequently sighted or examined.

Citta et al. (2014) found that the distribution of satellite-tagged bowhead whales in the Bering Sea spatially, but not temporally, overlapped with areas where commercial pot fisheries occurred, noting the potential risk of whales becoming entangled in derelict gear. The nation of origin for fishing gear that results in bowhead entanglement is largely unknown, with only one entanglement thus far having been traced back to any particular fishery (see below). A dead bowhead whale that was found floating in Kotzebue Sound in early July 2010, was entangled in crab pot gear similar to that used by commercial crabbers in the Bering Sea (Suydam et al. 2011; George et al. 2017). In July 2015, a dead adult female bowhead whale (2015-FD2) drifting near Saint Lawrence Island in the Bering Strait was found to be entangled in fishing gear (Suydam et al. 2016). The gear included lines, two floats, and an attached color coded/numbered permit tag that was traced back to the 2012/2013 U.S. winter commercial blue king crab fishery located in Saint Matthew Island waters of the northern Bering Sea (pers. comm. Gay Sheffield, Alaska Sea Grant and Savoonga Whaling Captains Association, 2015). Unpublished results from George et al. presented at the February 2018 Alaska Eskimo Whaling Commission Mini-convention in Utqiaġvik (Barrow), Alaska, indicates a three-fold spike in baleen glucocorticoids following entanglement of a subadult male bowhead that was subsequently harvested. As described in Hunt et al. (2014), baleen whales with elevated fecal glucocorticoids have been shown to reflect exposure to various acute and chronic stressors. While the Western Arctic bowhead stock is increasing at a relatively strong rate of 3.7 percent per year, these results indicate that entanglement in commercial fishing gear poses a direct threat to Western Arctic bowhead whales and that the issue warrants further monitoring and consideration. At the 2018 AEWC annual convention of whaling captains, the Alaska Bering Sea Crabbers attended and gave a presentation on their operations. In the discussion, they indicated their interest in engaging with AEWC and NSB to increase communication regarding bycatch, help determine the source of recovered gear (whether active or ghost gear), and availability to examine any new gear recovered from whales to assess gear-type and origin (Craig George, pers. comm; 2018).

3.2.7 Vessel Traffic

Shipping lanes in Northern Sea Route and the Northwest Passage to Europe and North America from Asia are now in use by cargo ships and fuel tankers, and there is projected to be as much as a 500% increase in traffic between 2015 and 2025 (Azzara et al. 2015). In response to increased Arctic shipping traffic (**Fig 3.2.7-1**), the United States and Russian Federation have proposed a system of voluntary two-way routes for all domestic and international ships to follow in the Bering Strait and Bering Sea (IMO 2017) (**Fig 3.2.7-2**). A similar effort for U.S. waters north of the Bering Strait and through the Alaskan Beaufort Sea is expected to commence in 2018.

Currently, vessel traffic in arctic waters is associated with extractive industries, commercial shipping, village resupply, and marine research, although cruise-based tourism is also beginning to occur. Variables that help determine whether marine mammals are likely to be disturbed by vessels include the number of vessels in an area, the distance from a vessel, vessel speed and direction, vessel noise, vessel type or size, and activity of the marine mammal. This increase in vessel traffic could result in an increased number of vessel collisions with bowhead whales (Huntington et al. 2015). Currently, ship-strike injuries appear to be uncommon on bowhead whales in Alaska (George et al., 2017b). Only ten whales harvested between 1990 and 2012 (approximately two percent of the total sample) showed clear evidence of scarring from ship propeller injuries. However, it should be noted that animals struck and killed immediately would not be available to hunters and therefore would not be reported; therefore, this estimate should be considered a minimum estimate.

Since the early 1990s, the Alaska Eskimo Whaling Commission, through its Open Water Season Conflict Avoidance Agreement with offshore oil and gas interests, has imposed vessel routing and speed guidelines that apply to vessels traveling in the vicinity of bowhead whales. The Agreement also calls for marine mammal observers to be stationed on vessels to ensure that the guidelines are observed. In recent years, as non-oil and gas-related vessel traffic in northern Alaskan waters, including marine research and cruise tourism, has increased, it is apparent that measures beyond the Conflict Avoidance Agreement are needed. In 2012 the Alaska Eskimo Whaling Commission, North Slope Borough, and other northern Alaska stakeholder groups, in consultation with the U.S. Coast Guard, established the Arctic Waterways Safety Committee. The Committee, established under the U.S. guidelines for Harbor Safety Committees, is in the process of developing an Arctic Waterways Safety Plan for U.S. waters extending from the northern Bering Sea to the border with Canada. The goal of these efforts is to protect bowhead whales from vessel interactions and to ensure the safety of subsistence hunters operating from small craft in the same waters as larger ocean-going vessels. See additional discussion of these initiatives in the following section.

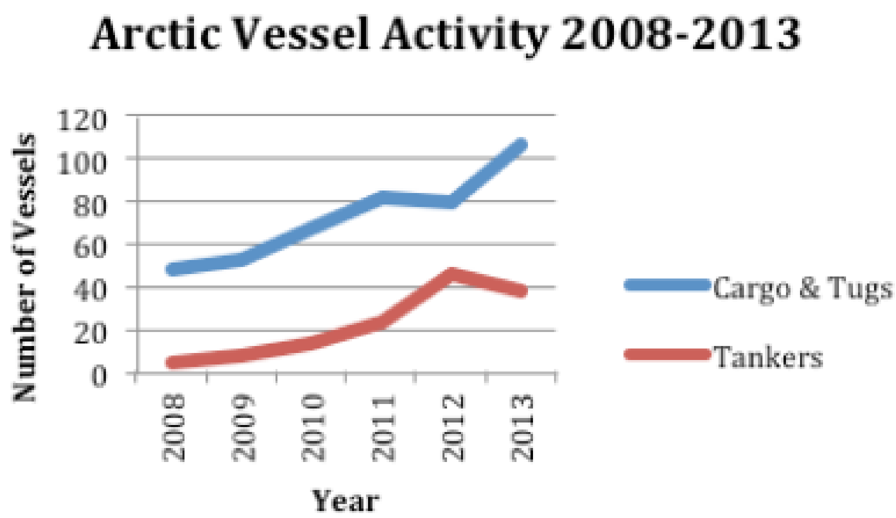

Figure 3.2.7-1. Increase in Arctic vessel activity from 2008-2013 (Azzara et al. 2015).

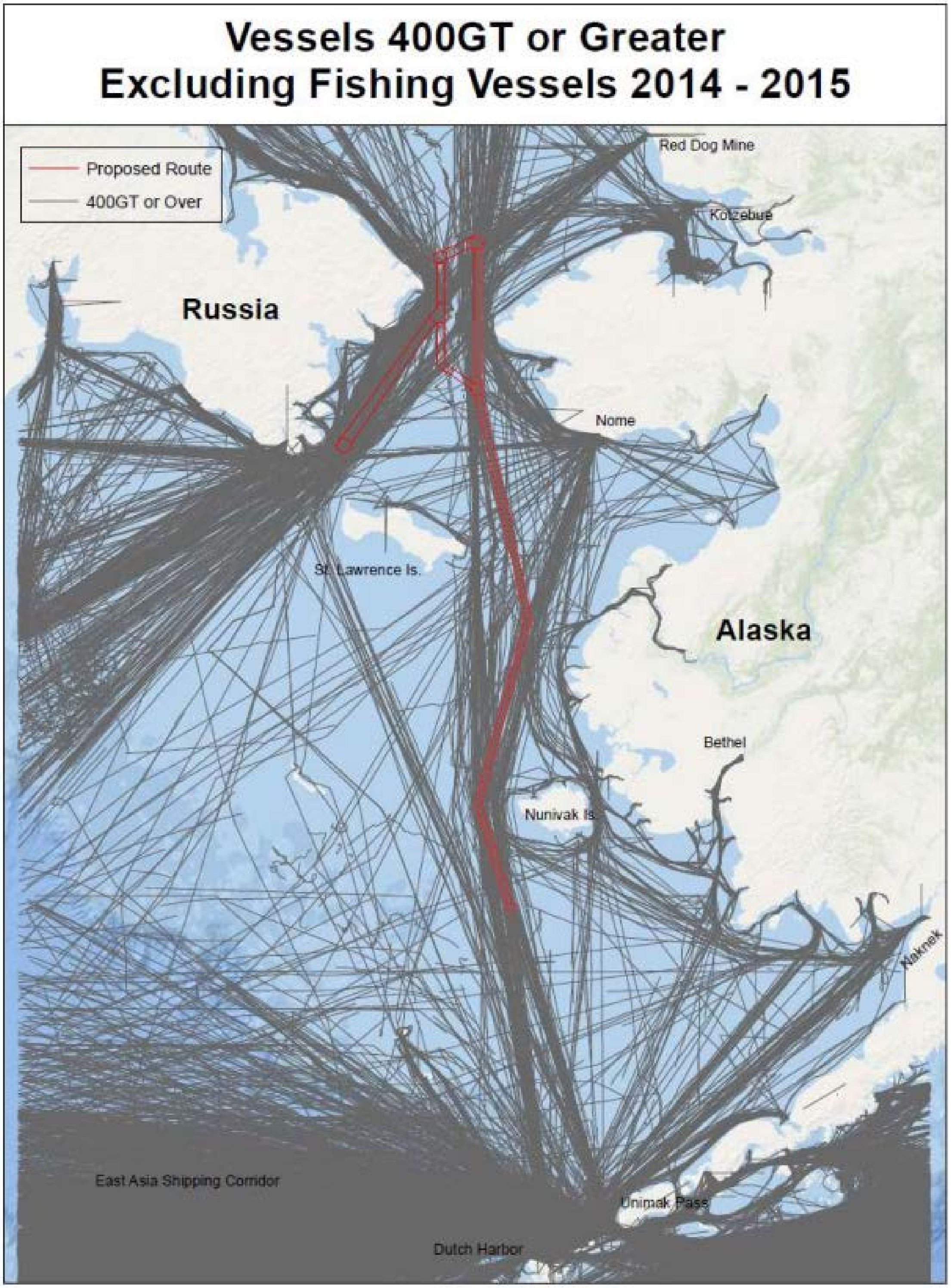

Figure 3.2.7-2. Vessel track lines for vessels of 400 gross tons or greater (excluding fishing vessels), with proposed United States and Russian Federation two-way vessel traffic routes in the Bering Strait and Bering Sea shown in red.

3.2.8 Offshore Activities, Petroleum Extraction

Oil and gas exploration and development were increasingly active in the Chukchi and Beaufort Sea through 2016 in portions of the Western Arctic bowhead whale stock habitat. Since then, activity in the Chukchi decreased substantially, while activity in the Beaufort remains at or above 2016 levels. Extensive information about the effects of oil and gas activities on bowhead whales is discussed in several documents. Biological opinions have been prepared by NMFS for the following projects:

(1) SAExploration, Inc. (SAE) 3D OBN Open-Water Seismic exploration in the Beaufort Sea, AK (NMFS, 2015a);

(2) Hilcorp Shallow Geohazard and Strudel Scour Surveys in Foggy Island Bay, Beaufort Sea, AK (NMFS, 2015b);

(3) Shell Exploration Drilling Program in the Chukchi Sea, AK (NMFS, 2015c);

(4) Lease Sale 193 Oil and Gas Exploration Activities, Chukchi Sea, Alaska (NMFS 2015d);

(5) SAExploration, Inc. (SAE) 3D OBN Open-Water Seismic in Colville River Delta, AK (NMFS, 2014a);

(6) BP Exploration (BPXA) Shallow Geohazard Survey Foggy Island Bay, Beaufort Sea, AK (2014b);

(7) BP Exploration (BPXA) 3D OBS Open-Water Seismic Survey Prudhoe Bay, Beaufort Sea, AK (2014c).

Additional biological opinions addressing federally funded, authorized, or conducted activities within the range of bowhead whales can be found at: https://alaskafisheries.noaa.gov/pr/biological-opinions. Many National Environmental Policy Act documents, such as Environmental Impact Statements, for Oil and Gas development operations, can be found at the Bureau of Ocean Energy Management (BOEM) Alaska Outer Continental Shelf (OCS) Region website: https://www.boem.gov/Alaska-Region/.

There have been 19 federal oil and gas lease sales proposed within the Alaskan Beaufort and Chukchi Seas, beginning with the Joint State of Alaska - Federal Sale held in December 1979 (BOEM Alaska website at https://www.boem.gov/Alaska-Leasing/, accessed 1/29/2018). The most recent federal lease sale in the Beaufort Sea planning area was Lease Sale 202, held on April 18, 2007. Three federal lease sales for the OCS were in the Chukchi Sea planning area between 1979 and 2008. Most recently, Chukchi Sea Lease Sale 193 was held in February 2008, and resulted in the sale of 487 leases totaling approximately 2.8 million acres in the Chukchi Sea planning area (Bureau of Ocean Energy Management, Regulation and Enforcement [BOEMRE 2011a]). As a result of a lawsuit challenging the sale, the U.S. District Court for the District of Alaska remanded Sale 193 f or further analysis pursuant to NEPA. After issuance of a Supplemental Environmental Impact Statement (SEIS) (OCS EIS/EA BOEMRE 2011a) in August 2011, the Department of the Interior filed a Record of Decision affirming the sale of the 487 leases under Lease Sale 193. The Ninth Circuit Court of Appeals remanded Sale 193 for still further analysis pursuant to NEPA in January 2014. A second supplemental EIS was released in February 2015 and in March 2015, BOEM issued a Record of Decision affirming lease sale 193.

There are presently two offshore production facilities within state waters in the Beaufort Sea: (1) Northstar, and (2) Endicott. Another offshore facility, Liberty, is planned for OCS waters off Foggy Island Bay (BOEM 2017). Five exploration wells were drilled in the Chukchi Sea planning area between 1989 and 1991, while another well was drilled in 2015. As of January 2018, no commercial oil production has occurred in the Chukchi Sea.

The potential effects of exploration and development projects and leasing of the OCS have been considered in the biological opinions regarding oil and gas leasing and exploration activities and oil production facilities (NMFS,2014a, 2014b, 2014c, 2015a, 2015b, 2015c, 2015d). These oil and gas activities include seismic exploration, geophysical exploration, icebreaking, and drilling, all of which introduce noise into the marine environment that may disturb bowhead whales. Additional information on recent and planned oil and gas exploration and development activity is in **Section 4.6.1.1** and **Section 4.6.1.2**.

Anthropogenic noise has been shown to cause avoidance behavior in migrating bowhead whales (see Southall et al. 2007 for a full discussion on anthropogenic noise and bowhead whales). Seismic activities and the use of icebreakers to support OCS activities present the highest probability for avoidance of any of the activities associated with oil exploration (NMFS, 2006; Hildebrand 2009). Studies have shown noise from icebreakers may be detected by acoustic instruments at distances exceeding 100+ kilometers (Roth et al. 2013; Geyer et al. 2016). It is reasonable, therefore, to assume that bowheads could also detect such noise at this distance. The distance at which migrating bowheads may react to noise is poorly described, however, Richardson (1999) indicated that migrating bowheads are essentially excluded from waters within 20 km of a seismic operation, but more recent work has shown that bowhead whale reactions to seismic noise are very behavior-dependent (Southall et al. 2007). Blackwell et al. (2013) found bowhead calling rates dropped significantly near seismic operations, which they later showed was the reaction to a noise level of ~ 127 dB re 1 μPa^2-s, with calling ceasing altogether at ~160 dB re 1 μPa^2-s (Blackwell et al., 2015). They also showed that calling rates began to increase as soon as airgun pulses were detectable, leveling off around 94 dB re 1 μPa^2-

s (Blackwell et al., 2015). Elevated sound levels in the marine environment could alter the hearing ability of whales, causing temporary or permanent threshold shifts if the sound levels are sufficiently high and the bowheads are in close proximity to the noise source (Guerra et al. 2011). While, at present, researchers have insufficient information on the hearing ability and sensitivities of bowhead whales to adequately describe this potential, it is generally understood that whales hear within similar frequency ranges of their vocalizations, which for bowheads seem to be in the range of 25-900 Hz with “songs” up to 5 kHz (Cummings and Holliday, 1998). Available information indicates that most continuous and impulsive underwater noise levels would be at levels or durations below those expected to injure hearing mechanisms. Nonetheless, marine seismic activities may present concerns with respect to hearing, which could impact the long-term survival of bowhead whales exposed to anthropogenic noise.

Since 1985, the AEWC has engaged in a project known as the Open Water Season Conflict Avoidance Agreement (CAA). This project involves annual negotiations with offshore exploration and development companies to reduce industrial impacts during bowhead whale migration, both to whales and to key areas of habitat for migrating bowhead whales. The Alaska Waterways Safety Committee (AWSC) was established in October 2014 as a self-governing multi-stakeholder (subsistence Hunters, industry, and other representatives) group focused on creating or documenting best practices to ensure a safe, efficient, and predictable operating environment for all users of the arctic waterways.

Seismic Surveys. Seismic surveys in marine waters in Alaska typically occur in the summer and fall when there is little ice on the ocean. These surveys are accomplished by sending sound waves down into the substratum (through the use of airguns) and receiving information about its oil-bearing potential based on the speed and strength of the returning echoes (National Research Council [NRC], 2003). Three types of offshore seismic surveys have occurred on the North Slope: marine streamer three-dimensional (3-D) and two-dimensional (2-D) surveys, ocean-bottom-cable seismic surveys, and high-resolution site-clearance surveys. Marine streamer 3-D and 2-D surveys involve a marine vessel that tows source arrays (airguns to generate acoustic energy) and passive-listening receiver equipment (called "streamers") to obtain geophysical data (MMS, 2006b). Streamers consist of long cables with multiple hydrophones that receive the echoes from the source energy as it bounces off the various substrata of the ocean floor. Airguns are the acoustic source for 3-D and 2-D seismic surveys.

Airgun arrays for both 3-D and 2-D seismic surveys emit pulsed rather than continuous sounds (MMS, 2006b, BOEM 2015). Airgun output usually is specified in terms of zero-to-peak or peak-to-peak levels (MMS, 2006b; Richardson et al., 1995a). Peak-to-peak values are about six decibels (dB) higher than zero-to-peak values (Richardson et al., 1995a). Airgun sizes refer to total airgun chamber volumes in cubic inches (in3), and individual guns may vary in size from a few tens to a few hundreds of cubic inches (MMS, 2006b). The sound-source level (zero-to-peak) associated with both 3-D and 2-D seismic surveys in Alaska can be as high as 240 dB relative to 1 microPascal at 1 meter (dB re 1 μPa at 1 m)[19] (MMS, 2006b). Seismic sounds vary, but a typical 2-D/3-D seismic survey with multiple guns would emit most energy at about 10-120 hertz (Hz), and pulses can contain energy up to 500-1,000 Hz (Richardson et al., 1995a). Goold and Fish (1998) recorded a pulse range of 200 Hz-22 kilohertz (kHz) from a 2-D survey using a 2,120-cubic-inch-array. While most of the energy is directed toward the ocean bottom and the short duration of each pulse limits the total energy, the sound can propagate horizontally for several kilometers (Greene and Richardson, 1988; Hall et al., 1994). In waters 25-50 m deep, sound produced by airguns can be detected 50-75 km away, and these detection ranges can exceed 100 km in deeper water (Richardson et al., 1995a). Blackwell et al. (2013) have received level measurements of >500K airgun pulses. Guerra et al. (2011) were able to show that the reverberation from air gun pulses could increase natural ambient levels out to >120 km. It is suspected that close proximity or long-term exposure to airgun noise could have effects on marine mammals, including hearing loss and elevated stress levels; it could also elicit behavioral disruptions (Richardson, 1995; Richardson and Würsig, 1995).

In any year in which offshore seismic activities occur in the Beaufort Sea, many migrating bowheads may be “taken” by harassment, as evidenced by changes in migratory behavior. In 2000, NMFS estimated the level of seismic takes between 1,275 and 2,550, and also estimated take of an average of 937 bowheads per year for 9 years (2015 - 2024) due to acoustic harassment in association with Lease sale 193. While high noise levels may affect whale hearing, or impact whales’ use of sound to communicate or navigate, studies on seismic research in the Beaufort Sea show that such effects on bowhead whales are likely temporary, typically below exposure levels likely to cause serious injury or death, and therefore unlikely to prevent the survival and recovery of this species, provided these activities are properly authorized and mitigated. Typical monitoring and mitigation activities for seismic include:

- NMFS-approved protected species observers (PSOs) document the number and species of marine mammals exposed to sounds from airguns, as well as the behavior and responses of marine mammals to project-related activities;
- Passive acoustic monitoring (PAM) is used to improve detection, identification, and localization of cetaceans and to alert visual observers when vocalizing cetaceans are detected;

[19] Sound pressure level (SPL) is typically measured in dB, which are a logarithmic unit that indicates the ratio of a physical quantity relative to a specified reference level. The standard reference level for sound pressure in water (through which sound waves propagate more efficiently than through air) is one microPascal (1 μPa), a measure of pressure. In underwater acoustics, the *source level* of a sound represents the pressure level at a certain distance, usually one meter, from the source, relative to one microPascal; thus, source levels are described using units of dB re 1 μPa at 1 m. The *received level* is the level of the sound at the listener's actual distance from the source; this is the value represented by the scientific phrase dB re 1 μPa rms (rms = root mean square, a statistical measure of the amplitude of the variable intensity of a sound wave).

- Exclusion zones are established within which marine mammals could be exposed to received sound levels associated with injury;

- Airgun shutdown procedures are implemented during the activity when marine mammals are detected within or about to enter the exclusion zone, to reduce the noise exposure level to below that which could cause injury to marine mammals and to reduce sound output overall when animals are close to the vessel, and;

- Airgun ramp-up procedures are implemented when the array is started, to provide marine mammals with a warning and to allow marine mammals to vacate the area.

The deflection of bowheads from known migratory routes, however, does affect bowhead whale hunters. According to TEK, hunters were unable to find whales or bearded seals during seismic activities (B. Rexford, former Chair of the AEWC, Pers. comm.; H. Aishanna, Kaktovik Whaling Captain, Pers. comm., Kaktovik Whaling Captains Association, Pers. comm.). Research on the effects of offshore seismic exploration in the Beaufort Sea, supported by the testimony of Iñupiat hunters based on their experience, has shown that bowhead whales avoid these operations when within 20 km of the source and may begin to deflect at distances up to 35 km (Richardson et al., 1999).

High-resolution seismic surveys have been used by the oil and gas industry primarily to locate shallow hazards; obtain engineering data for placement of structures (e.g., proposed platform locations and pipeline routes); and detect geohazards, archaeological resources, and certain types of benthic communities (MMS, 2006b). All involved ships are designed to be quiet, as the higher frequencies used in high-resolution work are easily masked by the vessel noise if special attention is not paid to keeping the ships quiet. Airgun volumes for high-resolution surveys typically are 90-150 in^3, and the output of a 90 in^3 airgun ranges from 229-233 dB re 1 μPa at 1 m (MMS, 2006b). Airgun pressures typically are 2,000 pounds per square inch (psi), although they can be used at 3,000 psi under certain circumstances (MMS, 2006b). Marine geophysical research or other activities involving seismic airguns may introduce significant levels of noise into the marine environment and have been demonstrated to alter the behavior of migrating bowhead whales.

Drilling. After seismic surveys indicate that commercially viable quantities of oil or gas may be present, exploratory drilling begins. Underwater noise levels from drill sites on natural or manmade islands are low, and inaudible at ranges beyond a few kilometers (Richardson et al., 1995a). Noise is transmitted very poorly from the drill rig machinery through land into the water (Richardson et al., 1995a). Drilling noise from icebound islands is generally confined to low frequencies and has a low source level. It would be audible at a range of 10 km only during unusually quiet periods; the usual audible range would be approximately 2 km (Richardson et al., 1995a). However, Davies (1997) concludes that bowheads were impacted much farther than 10 km away and avoided an active drilling rig at a distance of 20 km, and Schick and Urban (2000) found bowheads to avoid the rig at distances up to 50km. Similar to their work with airgun signals, Blackwell et al. (2017) again showed that sounds from drilling rigs have a multi-tiered effect on bowheads, with calling rates increasing once the drilling noise was detectable, leveling out at higher noise levels, and ceasing at high noise levels..

Under open water conditions, drilling sounds from islands may be detectable somewhat farther away, but the levels are still relatively low (Richardson et al., 1995a). Drilling noise from caisson-retained islands is much louder than natural or manmade islands (Richardson et al., 1995a). At least during open water conditions, noise is conducted more directly into the water at caisson-retained islands than at island drill sites. Noise levels are generally higher near drill ships than near semisubmersibles or caissons. The drill ship hull is well coupled to the water and semisubmersibles lack a large hull area. Machinery on semisubmersibles is mounted on decks raised above the sea on risers supported by submerged floating chambers. Sound and vibration paths to the water are through either the air or the risers, in contrast to the direct paths through the hull of a drill ship (Richardson et al., 1995a).

Acoustic research for the Northstar project, one of the activities covered under prior biological opinions, estimated that the numbers of bowhead whales that may have been deflected more than 2 km offshore due to that noise source ranged from 0 to 49 bowhead whales during 2001-2004. However, for the Liberty project (oil drilling conducted from a man-made island north of Foggy Island Bay), only 7 bowhead whales are expected to be subjected to MMPA Level B harassment take, while none are expected to experience Level A harassment during the first 5 years of the project (Hilcorp, 2018).

McDonald et al. (2012) showed that bowheads responded to industrial sounds at very low levels of received sounds. Often, the industrial sounds were below ambient. It is not clear whether their results indicated that bowheads deflected farther offshore or changed calling behavior, though the results did show that bowheads were very sensitive to low levels of anthropogenic sounds.

In summary, more sound is radiated underwater during drilling operations from drill ships than from semisubmersibles. In contrast, noise from drilling on natural islands radiates very poorly to water, making such operations relatively quiet. Noise levels from drilling platforms and certain types of caissons have not been well documented, but are apparently intermediate between those from vessels and islands (Richardson et al., 1995a), although they require the presence of many attending support vessels (Blackwell et al., 2017). By far, the noisiest exploratory activity is seismic surveys.

It should be noted that as exploration interest in the Beaufort Sea increased in the mid-2000s, the AEWC amended the Conflict Avoidance Agreement (CAA) to include restrictions on the disposal of drilling wastes into the water. Under the CAA, only seabed cuttings from the “top hole” may be discharged into the waters of the near shore Beaufort Sea. Once the top hole is established, all drilling waste must be re-injected or recovered and removed from the site.

Development. Once an economically viable discovery is made, development begins. This phase involves additional drilling, and the subsequent construction of roads; airstrips; and waste disposal, seawater treatment, gas handling, power generation, storage, maintenance, and residential facilities (NRC, 2003). McDonald et al. (2012) showed that ship sounds supporting a development island are some of the loudest sound sources associated with development. They also showed that bowheads respond most strongly to ship sounds. Greene (1983) measured noise under shorefast ice during winter construction of an artificial island near Prudhoe Bay. Roads were built on the sea ice and trucks hauled gravel to a site in water 12 m deep. At distances less than 3.6 km, there was no evidence of noise components above 1,000 Hz, and little energy below 1,000 Hz (Richardson et al., 1995a). Construction-related sounds did not propagate well in shallow water under the ice during winter (Richardson et al., 1995a).

Oil Spills. MMS investigated the probability of spilled oil contacting bowhead whales (MMS, 2002a). Specific offshore areas, termed Ice/Sea Segments were identified and modeled for probability of contact and overlay the migratory corridor of bowheads. Using data from the MMS oil spill analysis for Sale 170, and assuming an oil spill of 1,000 barrels or more occurred at any of several offshore release areas during the summer season, the chance of that oil contacting these regions within 30 days during the summer season ranged from 55 - 82%. Therefore, there is high variability from the effects of an oil spill impacting Ice/Sea Segment areas.

If an oil spill were concentrated in open water leads, it is possible that a bowhead whale could inhale enough vapors from a fresh spill to affect its health. The effects of oil contacting skin are largely speculative, but may include pre-disposing whales to infection. It has been suggested that if oil gets onto the eyes of bowhead whales it would enter the large conjunctival sac (Zhu, 1996) and move inward 4 to 5 inches (10 to 13 centimeters [cm]) and get behind most of the eye (T. Albert, NSB, Pers. comm.). The consequences of this event are uncertain, but some adverse effects are expected. Bowhead whales may ingest oil encountered on the surface of the sea during feeding, resulting in fouling of their baleen plates. Albert (1981) suggests that broken off baleen filaments and tar balls are of concern because of the structure of the bowhead's stomach and could cause a blockage within a narrow passage of the digestive system.

Engelhardt (1987) stated that bowhead whales are particularly vulnerable to effects from oil spills due to their use of ice edges and leads where spilled oil tends to accumulate. The impacts of oil exposure to the bowhead whale population would also depend upon how many animals contacted oil. If oil found its way into leads or ice-free areas frequented by migrating bowheads, a significant proportion of the population could be affected. The NSB believes there are some scenarios, such as an oil spill in a spring lead system near Utqiaġvik (Barrow), which could affect a large portion of the population. However, the likelihood of this is debatable, depending on how oil development proceeds (Craig George, North Slope Borough, Pers. comm., December 20, 2007).

While it is exceedingly difficult to predict the various aspects of an oil spill that would impact bowhead whales, it is reasonable to state that the numbers of whales that might be affected would be expected to be very small in terms of the current abundance. However, bowhead whales would be placed at particular risk in the event of a large oil spill occurring while the whales were migrating north through the Chukchi Sea, or east through the Beaufort Sea, traveling through the spring lead and polynya system. The number of whales affected may be much higher; however, as we must assume that the entire stock needs to make this migration to get to summering grounds. Whether such a spill would affect a significant portion of this population is uncertain.

Adult whales exposed to spilled oil likely would experience temporary, or perhaps permanent, effects. Recent work by Sformo et al. 2018 qualitatively confirms two previous studies by Geraci/St. Aubin and Braithwaite who also show that oil does not adhere well to baleen and would therefore be 'flushed' from the baleen plates and fringe hairs and not interfere with feeding to the degree described in NRC (2003). Prolonged exposure to freshly spilled oil could kill some whales, but the numbers are estimated to be small due to a low chance of such contact (MMS, 2006c). Studies of common bottlenose dolphins (*Tursiops truncates)* in Barataria Bay, Louisiana following the *Deepwater Horizon* oil spill provide evidence that a large oil spill can indeed affect cetaceans at the population level (Lane et al. 2015; Venn-Watson et al., 2015). However, there are no data available that definitively link a large oil spill with a significant population-level effect on a species of large cetacean.

While data from previous spills in other locations worldwide are broadly informative, there is uncertainty about the potential for population level effects or other potential outcomes should a large or very large spill occur in instances where whales are aggregated and/or constrained in their option for alternative routes (e.g., in the spring lead and polynya system due to ice conditions) or are aggregated in a feeding area, especially if aggregations contained large numbers of females and calves. The potential for a population level effect may exist if large numbers of females and calves, especially newborn or very young calves, were exposed to large amounts of freshly spilled oil. The uncertainty arises because:

(1) Of the unique ecology of the bowhead whale;
(2) Existing information about the effects of oil on very large cetaceans is inconclusive because of the challenges of studying large whales and, thus, it is not possible to confidently estimate the likelihood that serious injury to individual bowhead whales could or would occur with oil exposure;
(3) No agreement exists over the interpretation of post-Exxon Valdez oil-spill cetacean studies;
(4) There are not data sufficient to determine the vulnerability of newborn or other baleen calves to freshly spilled crude oil;
(5) It is very difficult, if not impossible, to obtain many of the kinds of data that have been gathered on some other marine mammals to assess acute or chronic adverse sublethal effects from an oil spill (or other affecters) on large cetaceans; and
(6) There is no other situation comparable to that which could exist if a large or very large oil spill occurred in, or moved into, the spring lead and polynya system[20], especially if this occurred when there were large numbers of females with newborn calves, occurred when calving was occurring, or occurred when hundreds of individuals were in the leads and polynya on their northward migration.

Most whales exposed to spilled oil could be expected to experience temporary, nonlethal effects from skin contact with oil, inhalation of hydrocarbon vapors, ingestion of oil-contaminated prey items, baleen fouling, reduction in food resources, or temporary displacement from some feeding areas. A few individuals may be killed as a result of exposure to freshly spilled oil. However, the combined probability of a spill occurring and also contacting bowhead habitat during periods when whales are present is considered to be low, and the percentage of the bowhead whale stock likely to be seriously affected by such a spill is expected to be very small. Contaminated food sources and displacement from feeding areas also may occur as a result of an oil spill, but NMFS has concluded it is unlikely that the availability of food sources for bowheads would be affected given the abundance of plankton resources in the Beaufort Sea (Bratton et al., 1993; NMFS, 2001).

3.3 Other Wildlife

A wide variety of marine mammals, birds, and other marine organisms occurs in the area where Alaska Natives hunt for bowhead whales. These species are identified and discussed briefly below. Additional information about each marine mammal species can be found in Muto et al. (2017), and is hereby incorporated by reference.

[20] The NE Chukchi Sea lead system is a known bowhead whale calving area.

3.3.1 Other Marine Mammals

Under the MMPA, marine mammals are protected by a prohibition on take; however, Section 101(b) of the MMPA generally provides that the provisions of the MMPA do not apply to subsistence hunting of marine mammals by Alaska Natives. The ESA contains a similar provision with respect to endangered or threatened species. Many Alaska Natives hunt a variety of marine mammals that occur within the range of the bowhead whale, including the spotted seal, bearded seal, ribbon seal, ringed seal, walrus, polar bear, and beluga whale, (NMFS 2009). A discussion of the current status and trends of all marine mammals that inhabit the area where Alaska Natives hunt for bowhead whales follows.

Spotted Seal. Spotted seals (*Phoca largha*) are distributed along the continental shelf of the Beaufort, Chukchi, Bering, and Okhotsk seas south to the western Sea of Japan and northern Yellow Sea (Shaughnessy and Fay, 1977). Eight main areas of spotted seal breeding have been reported (Shaughnessy and Fay 1977). On the basis of small samples and preliminary analyses of genetic composition, potential geographic barriers, and significance of breeding groups Boveng et al. (2009) grouped those breeding areas into three Distinct Population Segments (DPSs): The Bering DPS, which includes areas in the Beaufort, Chukchi and East Siberian seas; the Okhotsk DPS; and the Southern DPS, which includes spotted seals breeding in the Yellow Sea and Peter the Great Bay in the Sea of Japan.

Within the Bering Sea DPS, seals tagged with satellite-transmitters in the northeastern Chukchi Sea moved south in October and passed through the Bering Strait in November (Lowry et al., 1998). Spotted seals overwinter in the Bering Sea along the ice edge and tagged seals made east-west movements along the edge. During spring, seals tend to prefer small floes (i.e., less than 20 m in diameter), and inhabit mainly the southern margin of the ice in areas with water depths less than 200 m. Movement to coastal habitats occurs after the retreat of the sea ice (Fay, 1974; Shaughnessy and Fay, 1977; Lowry et al., 2000; Simpkins et al., 2003). Pups are born in the pack ice during March-April (Braham et al., 1984). In summer and fall, spotted seals use coastal haulouts (Frost et al., 1993; Lowry et al., 1998), and may be found as far north as 69° - 72° N in the Chukchi and Beaufort seas (Porsild, 1945; Shaughnessy and Fay, 1977).

A large segment (280,000 sq. km) of the breeding area was surveyed by helicopter from an icebreaker in the spring of 2007; the abundance of spotted seals was estimated using a model that incorporated variation due to detectability, availability (proportion hauled out), and changes in extent and concentration of sea ice during the surveys. The modal estimate of abundance was 233,700 spotted seals with a 95% credible interval of 137,300-793,100 (Ver Hoef et al., 2014). A more extensive fixed-wing aerial survey (767,000 sq. km) conducted during April-May of 2012 and 2013 encompassed the vast majority of the spotted seal breeding area. Analysis of a portion of the data, from 10 broadly distributed survey flights during 20-27 April 2012, resulted in a mean estimate of 460,268 spotted seals, with a 95% CI of 391,000-559,993 (Conn et al., 2014). The method accounted for uncertainty in detection rate and species classification, as well as availability. Currently, the Bering Sea DPS does not warrant listing under the ESA (74 FR 53683).

Spotted seals are an important species for Alaskan subsistence hunters, primarily in the Bering Strait and Yukon-Kuskokwim (Y-K) regions, with estimated annual harvests ranging from 850-3,600 seals taken during 1966-1976 (Lowry, 1984). As of August 2000, the subsistence harvest database indicated that the estimated number of spotted seals harvested for subsistence use per year was 5,265 animals (Muto et al. 2017). At this time, there are no efforts to quantify the total statewide level of harvest of spotted seals by all Alaska communities (Muto et al. 2017). The estimate of 5,265 spotted seals is the best estimate of harvest level currently available.

Bearded Seal. Bearded seals (*Erignathus barbatus*) are circumpolar in their distribution, extending from the Arctic Ocean south to Hokkaido in the western Pacific. In Alaskan waters, bearded seals occur on the continental shelves of the Bering, Chukchi, and Beaufort seas (Burns, 1981a; Johnson et al., 1966; Ognev, 1935). The majority of bearded seals move south with the seasonally advancing sea ice in winter (Burns, 1967). Pups are born in the pack ice from March through mid-May (Burns, 1967). In summer, many of the seals that winter in the Bering Sea move north through Bering Strait during April - June, and are distributed along the ice edge in the Chukchi Sea during the summer (Burns, 1967, 1981a). Some seals, particularly juveniles, may spend the summer in open-water areas of the Bering and Chukchi seas (Burns, 1981a).

Two subspecies of bearded seal have been described: *E. b. barbatus* from the North Atlantic Ocean, Hudson Bay, Barents Sea, and Laptev Sea (Rice 1998); and *E. b. nauticus* from "remaining portions of the Arctic Ocean and the Bering and Okhotsk seas" (Muto et al. 2018). However, there are not conspicuous gaps in the ranges of these two subspecies and they may overlap in areas along the central Canadian and northern Russian coasts (Muto et al. 2018). As part of a status review of the bearded seal, Cameron et al. (2010) defined longitude 112° W in the Canadian Arctic Archipelago as the North American delineation between the two subspecies, *E.b. barbatus* and *E. b. nauticus*, and 145° E as the Eurasian delineation between the two subspecies. Based on evidence for discreteness and ecological uniqueness of bearded seals in the Okhotsk Sea, the *E. b. nauticus* subspecies was further divided into an Okhotsk DPS and a Beringia DPS (that includes seals in the continental shelf waters of the Bering, Chukchi, Beaufort, and East Siberian seas).

Bearded seals occur in most of the area where the bowhead subsistence hunt occurs, with their relative abundance and habitat use in different parts of the area varying seasonally and with variations in habitat features. In the spring, bearded seals are most likely to occur 20-100 nmi from shore, except there can be high concentrations of this species occurring in the spring in areas nearshore to the south of Kivalina (Simpkins et al. 2003, Bengtson et al. 2005), one of the villages from which bowhead hunting occurs. From late April through June, large numbers of bearded seals migrate through the Bering Strait into the Chukchi Sea from wintering areas in the Bering Sea (Burns 1967, 1981). However, acoustic data indicate that at least adult male seals occur nearly year-round (peak occurrence in December-June, when sea ice concentrations were >50 percent) at multiple locations in the Bering, Chukchi, and Beaufort seas (MacIntyre et al. 2013, MacIntyre et al. 2015).

Early estimates of the Bering-Chukchi Sea stock range from 250,000 to 300,000 animals (Popov, 1976; Burns, 1981a; Burns et al., 1981a). A reliable population estimate for the entire stock is not available, but research programs have recently developed new survey methods and partial, but useful, abundance estimates. In spring of 2012 and 2013, U.S. and Russian researchers conducted aerial abundance and distribution surveys over the entire Bering Sea and Sea of Okhotsk (Moreland et al., 2013). The data from these image-based surveys are still being analyzed, but Conn et al. (2014), using a very limited sub-sample of the data collected from the U.S. portion of the Bering Sea in 2012, calculated an abundance estimate for Beringia bearded seal of approximately 299,174 (95% CI: 245,476-360,544) bearded seals in U.S. waters. These data do not include bearded seals that were in the Chukchi and Beaufort seas at the time of the surveys. PBR for only the portion of this DPS that overwinters and breeds in the U.S. portion of the Bering Sea is 8,210 seals. A PBR for the whole stock is not available.

On December 28, 2012, NMFS listed the Beringia DPS bearded seal (*E. b. nauticus*) and, thus, the Alaska stock of bearded seals, as threatened under the ESA (77 FR 76740). The primary concern for this population is the ongoing and projected loss of sea-ice cover stemming from climate change, which is expected to pose a significant threat to the persistence of these seals in the near future (based on projections through the end of the 21st century; Cameron et al. 2010). On July 25, 2014, the U.S. District Court for the District of Alaska issued a decision vacating NMFS' listing of the Beringia DPS of bearded seals as a threatened species (*Alaska Oil and Gas Association, et al. v. Pritzker*, Case No. 4:13-cv-00018-RPB). However, on October 24, 2016, the U.S. Court of Appeals for the Ninth Circuit reversed the judgment of the District Court, and the Supreme Court subsequently declined to hear an appeal of the Ninth Circuit's decision. *See Alaska Oil and Gas Association, et al. v. Pritzker*, 840 F. 3d 671 (9th Cir. 2016), *cert. denied*, 583 U.S. ____ (U.S. Jan. 22, 2018). Therefore, the ESA listing remains in effect.

Bearded seals are an important species for Alaskan subsistence hunters. Approximately 64 Alaska Native communities in western and northern Alaska, from Bristol Bay to the Beaufort Sea, regularly harvest ice seals (Ice Seal Committee 2016). The Ice Seal Committee, as co-managers with NMFS, recognizes the importance of harvest information and has collected it since 2008, when funding and personnel have allowed. Annual household survey results compiled in a statewide harvest report include historical ice seal harvest information back to

1960 (Quakenbush et al. 2011). This report is used to determine where and how often harvest information was collected and where to focus in the future (Ice Seal Committee 2016). Information for 2009-2013 is available for 12 communities (Point Lay, Kivalina, Noatak, Buckland, Deering, Emmonak, Scammon Bay, Hooper Bay, Tununak, Quinhagak, Togiak, and Twin Hills) (Table 2); but more than 50 other communities harvest bearded seals and have not been surveyed in this time period or have never been surveyed. Harvest surveys are designed to estimate harvest within the surveyed community, but because of differences in seal availability, cultural hunting practices, and environmental conditions, extrapolating harvest numbers beyond that community is not appropriate. For example, during 2009-2013, only 12 of 64 coastal communities were surveyed for bearded seals; and, of those communities, only 6 were surveyed for two or more consecutive years (Ice Seal Committee 2016). Based on the harvest data from 12 communities, a minimum estimate of the average annual harvest of bearded seals in 2009-2013 is 390 seals (Muto et al., 2017).

Ribbon Seal. Ribbon seals (*Phoca fasciata*) inhabit the North Pacific Ocean and adjacent parts of the Arctic Ocean. In Alaska waters, ribbon seals range from the North Pacific Ocean and Bering Sea into the Chukchi and western Beaufort seas. From late March to early May, ribbon seals inhabit the Bering Sea ice front (Burns 1970, 1981; Braham et al. 1984). Ribbon seals are very rarely seen on shorefast ice or land. They are most abundant in the northern part of the ice front in the central and western parts of the Bering Sea (Burns 1970, Burns et al. 1981). As the ice recedes in May to mid-July, the seals move farther to the north in the Bering Sea, where they haul out on the receding ice edge and remnant ice (Burns 1970, 1981; Burns et al. 1981). As the ice melts, seals become more concentrated, with at least part of the Bering Sea population moving towards the Bering Strait and the southern part of the Chukchi Sea. By the time the Bering Sea ice recedes through the Bering Strait, there is usually only a small number of ribbon seals hauled out on the ice. Ten ribbon seals tagged in the spring of 2005 near the eastern coast of Kamchatka spent the summer and fall throughout the Bering Sea and Aleutian Islands. However, of 72 ribbon seals satellite tagged in the central Bering Sea during 2007-2010, only 21 (29%) moved to the Bering Strait, Chukchi Sea, or Arctic Basin as the ice retreated northward. About 9.5% of ribbon seals' time budget during July through October was in those areas. The majority of the seals tagged in the central Bering Sea did not pass north of the Bering Strait. These seals, and the 10 seals tagged in 2005 near Kamchatka, dispersed widely, occupying coastal areas as well as the interior of the Bering Sea, both on and off the continental shelf (Boveng et al., 2013). Year-long passive acoustic sampling on the Chukchi Plateau from autumn 2008-2009 detected ribbon seal calls only in October and November 2008 (Moore et al., 2012).

A reliable population estimate for the entire stock is not available, but research programs have recently developed new survey methods and partial, but useful, abundance estimates. In spring of 2012 and 2013, U.S. and Russian researchers conducted aerial abundance and distribution surveys of the entire Bering Sea and Sea of Okhotsk (Moreland et al. 2013). The data from these image-based surveys are still being analyzed, but Conn et al. (2014), using a very limited sub-sample of the data collected from the U.S. portion of the Bering Sea in 2012, calculated an abundance estimate of approximately 184,000 (95% CI: 145,752-230,134) ribbon seals in those waters. Though this should be considered only a preliminary estimate, it is appropriate to consider this a reasonable estimate for the entire U.S. population of ribbon seals because few ribbon seals are expected to be north of the Bering Strait in the spring when these surveys were conducted. When the final analyses for both the Bering and Okhotsk seas are complete they should provide the first range-wide estimates of ribbon seal abundance (Muto et al. 2017). An ESA status review of the ribbon seal was completed in 2008 (Boveng et al. 2008), at which time NMFS determined that listing ribbon seals was not warranted at this time (73 FR 79822).

Ribbon seals are an important resource for Alaska Native subsistence hunters. The Ice Seal Committee, as co-managers with NMFS, recognizes the importance of harvest information and has been collecting it since 2008 as funding and available personnel have allowed. Annual household survey results are compiled in a statewide harvest report that includes historical ice seal harvest information back to 1960. This report is used to determine where and how often harvest information has been collected and where efforts need to be focused in the future (Ice Seal Committee 2014). Current information, within the last 5 years, is available for 11 communities (Kivalina, Noatak, Buckland, Deering, Emmonak, Scammon Bay, Hooper Bay, Tununak, Quinhagak, Togiak, and Twin Hills) (Table 2), but more than 50 other communities harvest ribbon seals and have not been surveyed in the last 5 years or have never been surveyed. Harvest surveys are designed to confidently estimate harvest within the surveyed community, but because of differences in seal availability, cultural hunting practices, and environmental conditions, extrapolating harvest numbers beyond that community is misleading. For example, during the past 5 years (2009-2013), only 11 of the 64 coastal communities have been surveyed for ribbon seals and of those only 6 have been surveyed for two or more consecutive years (Ice Seal Committee 2015). Based on the harvest data from these 11 communities (Table 2), a minimum estimate of the average annual harvest of ribbon seals in 2009-2013 is 3.2 seals.

Ringed Seal. Ringed seals (*Phoca hispida*) have a circumpolar distribution and are found in all seasonally ice-covered seas of the Northern Hemisphere as well as in certain freshwater lakes (King 1983). Most taxonomists currently recognize five subspecies of ringed seals, the threatened subspecies of which (*Phoca hispida hispida*) occurs in the Arctic Ocean and Bering Sea (Kelly et al., 2010a).

Throughout their range, ringed seals have an affinity for ice-covered waters and are well adapted to occupying both shorefast and pack ice (Kelly 1988a). They remain with the ice most of the year and use it as a platform for pupping and nursing in late winter to early spring, for molting in late spring to early summer, and for resting at other times of the year. This species rarely comes ashore in the Arctic; however, in more southerly portions of its range where sea or lake ice is absent during summer and fall, ringed seals are known to use isolated haul-out sites on land for molting and resting (Härkönen et al. 1998, Trukhin 2000, Kunnasranta 2001, Lukin et al. 2006). In Alaska waters, during winter and early spring when sea ice is at its maximal extent, ringed seals are abundant in the northern Bering Sea, Norton and Kotzebue Sounds, and throughout the Chukchi and Beaufort seas. They occur as far south as Bristol Bay in years of extensive ice coverage but generally are not abundant south of Norton Sound except in nearshore areas (Frost 1985). Although details of their seasonal movements have not been adequately documented, most ringed seals that winter in the Bering and Chukchi seas are thought to migrate north in spring as the seasonal ice melts and retreats (Burns 1970) and spend summers in the pack ice of the northern Chukchi and Beaufort seas, as well as in nearshore ice remnants in the Beaufort Sea (Frost 1985). During summer, ringed seals range hundreds to thousands of kilometers to forage along ice edges or in highly productive open-water areas (Harwood and Stirling 1992, Freitas et al. 2008, Kelly et al. 2010b, Harwood et al. 2015). With the onset of freeze-up in the fall, ringed seal movements become increasingly restricted. Seals that have summered in the Beaufort Sea are thought to move west and south with the advancing ice pack, with many seals dispersing throughout the Chukchi and Bering seas while some remain in the Beaufort Sea (Frost and Lowry 1984, Crawford et al. 2012, Harwood et al. 2012). Some adult ringed seals return to the same small home ranges they occupied during the previous winter (Kelly et al. 2010b).

Though a reliable population estimate for the entire Alaska stock is not available, research programs have recently developed new survey methods and partial, but useful, abundance estimates. In spring of 2012 and 2013, U.S. and Russian researchers conducted aerial abundance and distribution surveys of the entire Bering Sea and Sea of Okhotsk (Moreland et al. 2013). The data from these image-based surveys are still being analyzed, but Conn et al. (2014), using a very limited sub-sample of the data collected from the U.S. portion of the Bering Sea in 2012, calculated an abundance estimate of about 170,000 ringed seals. This estimate did not account for availability bias and did not include ringed seals in the shorefast ice zone, which were surveyed using a different method. Thus, the actual number of ringed seals in the U.S. sector of the Bering Sea is likely much higher, perhaps by a factor of two or more.

On December 28, 2012, NMFS listed Arctic ringed seals (*P. h. hispida*) and, thus, the Alaska stock of ringed seals, as threatened under the ESA (77 FR 76706). The primary concern for this population is the ongoing and anticipated loss of sea ice and snow cover stemming from climate change, which is expected to pose a significant threat to the persistence of these seals in the foreseeable future (based on projections through the end of the 21st century; Kelly et al. 2010a). Because of its threatened status under the ESA, this stock was designated as depleted under the MMPA. As a result, the stock was classified as a strategic stock. On March 11, 2016, the U.S. District Court for the District of Alaska issued a decision vacating NMFS' listing of Arctic ringed seals as a threatened species (*Alaska Oil and Gas Association, et al. v. Pritzker*, Case No. 4:14-cv-00029-RPB). However, on February 12, 2018, the U.S. Court of Appeals for the Ninth

Circuit reversed the judgment of the District court. *See Alaska Oil and Gas Association, et al. v. Ross*, Case No. 16-35380 (9th Cir. filed Feb. 12, 2018). Therefore, the ESA listing remains in effect.

While a reliable estimate of abundance for the entire population is not available (Muto et al. 2018), all available evidence indicates that the population of this DPS is large. Kelly et al. (2010) provided an estimate of at least 300,000 ringed seals for the total population in the Alaska Chukchi and Beaufort seas, but Muto et al. (2018) summarize that this is likely an underestimate due to limitations of the surveys that provided data for the estimate. Conn et al. (2014) provided a 2012 abundance estimate of 170,000 for those ringed seals in the U.S. sector of the Bering Sea. Because of the uncertainty about population size, there is currently not a PBR available for the Alaska stock of ringed seals.

Ringed seals are an important species for Alaska Native subsistence hunters. Information for 2009-2013 is available for 12 communities (Point Lay, Kivalina, Noatak, Buckland, Deering, Emmonak, Scammon Bay, Hooper Bay, Tununak, Quinhagak, Togiak, and Twin Hills) (Table 3), but more than 50 other communities harvest ringed seals and have not been surveyed in this time period or have never been surveyed. Harvest surveys are designed to estimate harvest within the surveyed community, but because of differences in seal availability, cultural hunting practices, and environmental conditions, extrapolating harvest numbers beyond that community is not appropriate. For example, during 2009-2013, only 12 of 64 coastal communities were surveyed for ringed seals; and, of those communities, only 6 were surveyed for two or more consecutive years (Ice Seal Committee 2016). Based on the harvest data from these 12 communities, a minimum estimate of the average annual harvest of ringed seals in 2009-2013 is 1,050 seals.

Pacific Walrus. The Pacific walrus (*Odobenus rosmarus*) range throughout the continental shelf waters of the Bering and Chukchi Seas, occasionally moving into the East Siberian Sea and the Beaufort Sea. During the summer months most of the population migrates into the Chukchi Sea; however, several thousand animals, primarily adult males, aggregate near coastal haulouts in the Gulf of Anadyr, Russia; Bering Strait, and Bristol Bay, Alaska. During the winter breeding season walruses are found in three concentration areas of the Bering Sea where open leads, polynyas, or thin ice occur (Fay et al. 1984, Garlich-Miller et al. 2011a). While the specific location of these groups varies annually and seasonally depending upon the extent of the sea ice, generally one group occurs near the Gulf of Anadyr, another south of St. Lawrence Island, and a third in the southeastern Bering Sea south of Nunivak Island into northwestern Bristol Bay. However, Pacific walruses are currently managed as a single panmictic population. Scribner et al. (1997) found no difference in mitochondrial and nuclear DNA among walruses sampled shortly after the breeding season from four areas of the Bering Sea (Gulf of Anadyr, Koryak Coast, Southeast Bering Sea, and St. Lawrence Island).

Pacific walruses typically use sea-ice as a resting platform between feeding dives, as a birthing substrate, for shelter from storms, isolation from predators, and passive transportation (Fay 1982). Historically, the summer distribution of walruses in the Chukchi Sea occurred primarily on sea ice over the continental shelf from the Alaska to Chukotka coasts with large numbers of animals near Hanna Shoal in the United States and Wrangel Island in the Russian Federation. A few animals would be observed utilizing haulouts along both the Alaska and Chukotka coasts, particularly in the fall. While the overall geographic range of Pacific walruses has not changed, over the past decade the number of walruses coming to shore along the coastline of the Chukchi Sea in both Alaska and Chukotka has increased from the hundreds to thousands to greater than 100,000 (Kavry et al. 2008, Garlich-Miller et al. 2011a, Jay et al. 2011). Additionally, adult female and young walruses are arriving at these coastal haulouts as much as a month earlier and staying at the coastal haulouts a week or two longer. In fall 2007, 2009, 2010, and 2011 large walrus aggregations (3,000 to 20,000) were observed along the Alaska coast (Garlich-Miller et al. 2011a). This increased use of coastal haulouts is a function of the loss of summer sea ice over the continental shelf (Garlich-Miller et al. 2011a). Summer sea ice extent in the Chukchi Sea has decreased by about 12% per decade (NSIDC 2012); retreating off the shallow continental shelf and remaining only over deep Arctic Ocean waters where walruses cannot reach the benthos to feed. Declines in Chukchi Sea ice extent, duration, and thickness are projected to continue in a linear fashion into the foreseeable future (Douglas 2010).

The current size and trend of the Pacific walrus population is unknown (Gorbics et al., 1998; Allen and Angliss, 2011; Speckman et al., 2011). The total initial estimate of 270,000 to 290,000 animals in 1980 was later adjusted to about 290,700 to 310,000 (Fay et al. 1997). A joint U.S. - Russia survey in 2006 led to a minimum estimate of 129,000 (95% CI 55,000-507,000) walrus for the ice habitat areas surveyed (Speckman et al. 2011).

Subsistence harvest mortality levels in the U.S. for 2006 - 2010 ranged from 3,828 to 6,119 animals per year (USFWS, 2012a). Pacific walrus are not designated as depleted under the MMPA. Further, the USFWS announced on 4 October 2017 that the listing of the Pacific walrus as threatened or endangered under the ESA was not warranted. The species is no longer listed as a candidate species under the ESA.

Polar Bear. Polar bears (*Ursus maritimus*) are circumpolar in their distribution in the northern hemisphere. Two stocks occur in Alaska: the Chukchi/Bering seas stock and the Southern Beaufort Sea stock. Polar bear movements are extensive and individual activity areas are enormous. Amstrup and DeMaster (1988) estimated the Alaska population (both stocks) at 3,000 to 5,000 animals based on densities calculated previously by Amstrup et al. (1986). The Chukchi Sea population is estimated to comprise 2,000 animals, based on extrapolation of aerial den surveys (Lunn et al. 2002). Estimates of the population have been derived from observations of dens and aerial surveys (Chelintsev 1977, Stishov 1991a, Stishov 1991b, Stishov et al. 1991); however, these estimates have wide confidence intervals and are considered to be of little value for management and cannot be used to evaluate status and trends for this population.

A population estimate of 1,526 (95% CI=1211−1841; Coefficient of Variation [CV] =0.106) (Regehr et al. 2006) for the Southern Beaufort Sea stock, which is based on open population capture-recapture data collected from 2001 to 2006, is considered the most current and valid population estimate. Polar bears in both stocks are currently classified as depleted under the MMPA and listed as threatened under the ESA (73 FR 28212). Critical habitat was designated December 7, 2010 and includes 464,924 sq. km of sea-ice habitat, 14,652 sq. km of terrestrial denning habitat, and 10,576 sq. km of barrier island habitat (75 FR 76086).

Prior to the twentieth century, when primarily Alaska Natives hunted Alaska's polar bears, both stocks probably existed near K. The size of the Beaufort Sea stock appeared to decline substantially in the late 1960s and early 1970s due to excessive harvest rates when sport hunting was legal. Similar declines could have occurred in the Chukchi Sea, although data are unavailable to test that assumption. Since passage of the MMPA, only subsistence harvests by Alaska Natives have been permitted and overall harvest rates have declined.

As described in Rode et al. (2013) body size, condition, and reproductive indices of Chukchi/Bering Seas polar bears did not decline over time between 1986–1994 and 2008–2011 despite a 44-day increase in the number of reduced ice days. Chukchi and Bering Seas bears were larger, in better condition, and appeared to have higher recruitment compared to the adjacent southern Beaufort Sea population during 2008–2011.

The annual harvest from the Chukchi/Bering seas stock was 92 per year in the 1980s, 49 per year in the 1990s, and 43 per year in the 2000s. More recently, the 2003−2007 average Alaska harvest for the Chukchi/Bering seas stock in Alaska was 37 and the sex ratio was 66M to 34F (Muto et al. 2017). During the 1980−2007 period the Alaska harvest from the Southern Beaufort Sea accounted for 34% of the total Alaska kill (annual mean=33 bears) with the remaining 66% occurring in the Chukchi Sea. The sex ratio of the harvest from 1980−2007 in the Southern Beaufort Sea was 69M to 31F.

Gray Whale. Gray whales (*Eschrichtius robustus*) occur across the coastal and shallow water areas of both the eastern and western reaches of the North Pacific Ocean, as well as the Bering, Chukchi, and Beaufort seas. Two stocks are recognized: the western Pacific or Korean stock (listed as endangered under the ESA) and the eastern North Pacific stock (removed from the ESA in 1994, Rugh et al., 1999). Overlap in the ranges of these two stocks was recently determined via photographic matches of western Pacific gray whales obtained in areas thought to only be occupied by eastern North Pacific gray whales such as the Mexico lagoons and along the

U.S. and Canadian coast (Weller et al. 2012). Western gray whales tagged with satellite transmitters have also traveled from Russian waters and crossed the Bering Sea/Aleutian Island passes and Gulf of Alaska to shelf waters off the Washington and Oregon coast (Mate et al. 2015). A majority of the eastern North Pacific population migrates annually along the coast of North America from summer feeding areas in the Bering, Chukchi, and Beaufort seas to winter grounds in sheltered waters along the Baja Peninsula (Rice and Wolman, 1971). A small number (< 200) of whales, called the Pacific Coast Feeding Group, summer and feed along the Pacific coast between southeast Alaska and northern California.

The eastern North Pacific gray whale population has made a remarkable recovery since its depletion in the early 1900s caused by commercial whaling. Gray whales were listed as endangered under the ESA on June 2, 1970 (35 FR 8495). Then, following a comprehensive evaluation of their status (Breiwick and Braham, 1984), NMFS concluded on November 9, 1984 (49 FR 44774), that this population should be listed as threatened, instead of endangered, under the ESA. However, no further action was taken until 1991 when a subsequent review was completed and made available to the public on June 27, 1991 (56 FR 29471). The latter review showed the best available abundance estimate (in 1987/88) was 21,296 whales with an average annual ROI of 3.29% (Buckland et al., 1993). Calculations indicated that this population was approaching K (Reilly, 1992) and on November 22, 1991 (56 FR 58869) NMFS proposed that this population be removed from the list of endangered and threatened wildlife under the ESA. After an extensive review period, NMFS published a final notice of determination (58 FR 3121) that this population should be removed from the list because the population had recovered to near its estimated original population size and was neither in danger of extinction throughout all or a significant portion of its range, nor likely to again become endangered within the foreseeable future. On June 16, 1994 (59 FR 31094), the eastern North Pacific gray whale population was formally removed from the list of endangered and threatened wildlife under the ESA.

The nearshore migration route of gray whales off the west coast of North America has enabled repeated abundance estimates from systematic shore-based counts off central California. In 23 years, between 1967 and 2007, counts of the number of observed pods travelling southbound have been rescaled using estimates of pods undetected during watch periods, pods passing outside watch periods, and night travel rate (see Laake et al. 2012). Rugh et al. (2008) evaluated the accuracy of various components of the shore-based survey method, with a focus on pod size estimation. They found that the correction factors that had been used to compensate for bias in pod size estimates have been calculated differently for different sets of years; thus a reevaluation of the analysis techniques and a reanalysis of the abundance estimates were warranted to apply a more uniform approach throughout the years. Laake et al. (2012) developed a more consistent approach to abundance estimation that used a better model for pod size bias with weaker assumptions. They applied their estimation approach to re-estimate abundance for all 23 surveys. The revised abundance estimates between 1967 and 1987 were generally larger than previous abundance estimates; differences by year between the revised and previous abundance estimates for this subset of years ranged from -2.5% to 21%. However, for the subset of surveys conducted between1992 and 2006, estimates were uniformly smaller (-4.9% to -29%) than previous estimates. Reevaluation of the correction for pod size bias and the other changes made to the estimation procedure yielded a somewhat different trajectory for population growth. The estimates still showed the population increased steadily from the 1960s until the 1980s. Previously, the peak abundance estimate was in 1998 followed by a large drop in numbers (Rugh et al., 2008). The revised estimates indicate the peak estimate of 26,916 (CV = 6.1%) was a decade earlier in 1987/88. The revised estimates for surveys conducted between 2000 and 2007 are: 16,369 (CV = 6.1%) in 2000/01, 16,033 (CV = 6.9%) in 2001/02, and 19,126 (CV = 7.1%) in 2006/07. Revised estimates from the three years prior are 20,103 (CV = 5.6%) in 1993/1994, 20,944 (CV = 6.1%) in 1995/1996, and 21,135 (CV = 6.8%) in 1997/1998 (Laake et al., 2012).

The shore-based counting method described above estimated detection probability (p) from the detection-non-detection of pods by two independent observers. However, tracking distinct pods in the field can be difficult for single observers; resulting in biased estimates of pod sizes that needed correcting, and matching observations of the same pod by both observers involved key assumptions. Due to these limitations, a new observation approach was adopted in 2006/2007 wherein a paired team of observers worked together and used a computerized mapping application to track and enumerate distinct pods and tally the number of whales passing during watch periods (Durban et al. 2015). This approach produced consistent counts over four monitored migrations (2006/07, 2007/08, 2009/10 and 2010/11), with an apparent increase in p compared to the previous method. To evaluate p and estimate abundance in these four years, counts from two independent stations of paired observers operating simultaneously were compared using a hierarchical Bayesian 'N-mixture' model to simultaneously estimate p and abundance without the challenge of matching pods between stations. The overall average detectability po =0.80 (95% Highest Posterior Density Intervals [HPDI] =0.75-0.85), which varied with observation conditions, observer effects and changes in whale abundance during the migration. Abundance changes were described using Bayesian model selection between a parametric model for a normally distributed common migration trend and a semi-parametric model that estimated the time trends independently for each year; the resultant migration curve was a weighted compromise between models, allowing for key departures from the common trend. The summed estimates of migration abundance ranged from 17,820 (95% HPDI=16,150-19,920) in 2007/8 to 21,210 (95% HPDI=19,420-23,230) in 2009/10, consistent with previous estimates and indicative of a stable population size.

Counting methods and analytical techniques for 2014/2015 and 2015/2016 estimates (see Durban et al. 2017) closely followed those mentioned above and described in Durban et al. (2015) for four previous abundance estimates between 2006/7 and 2011/12. The 2014/2015 estimate was

28,790 (95% HDPI=23,620-39,210) and the 2015/16 estimate was 26,960 (95% HDPI=24,420-29,830). There was consistency between the model predictions and observed counts for both years. However, daily and total abundance in 2014/15 were subject to considerable uncertainty, as shown by the large error bars associated with each of the daily estimates and the large coefficient of variation (CV = posterior standard deviation / posterior median; CV_{2015} =0.13). This is likely explained in part by the results of model fitting, as significant departures from the Normal migration model (probability of Normal model <0.25) were estimated in 18/90 days in 2014/2015 compared to only 9/90 days in 2015/16. These departures, and the uncertainty associated with estimating an independent migration curve, constrained estimation of a precise migration curve. In contrast, the CV_{2016} =0.05 was consistent with previous estimates using this counting approach and model (CV = 0.04-0.06 for four previous estimates since 2006/2007), and this estimate was therefore more useful for interpreting in the context of the abundance time series. Differences in the CVs from the two years demonstrated the value of completing two counts and abundance estimates in back-to-back years, which provided a measure of redundancy.

The Eastern North Pacific population of gray whales experienced an unusual mortality event in 1999 and 2000. An unusually high number of gray whales were stranded along the west coast of North America in those years (Moore et al., 2001; Gulland et al., 2005). Over 60% of the dead whales were adults, and more adults and subadults stranded in 1999 and 2000 relative to the years prior to the mortality event (1996 - 1998), when calf strandings were more common. Many of the stranded whales were in an emaciated condition, and aerial photogrammetry documented that gray whales were skinnier in girth in1999 relative to previous years (Perryman and Lynn, 2002). In addition, calf production in 1999, 2000 and 2001 was less than one-third of that in prior to the UME in 1997 and 1998 (Perryman et al. 2017). Several factors since this mortality event suggest that the high mortality rate was a short-term, acute event and not a chronic situation or trend: 1) in 2001 and 2002, strandings of gray whales along the coast decreased to levels that were below their pre- 1999 level (Gulland et al., 2005), 2) average calf production in 2002, 2003 and 2004 rebounded to levels similar to those seen prior to 1999, and 3) in 2001 living whales no longer appeared to be emaciated. A Working Group on Marine Mammal Unusual Mortality Events (Gulland et al., 2005) concluded that the emaciated condition of many of the stranded whales supported the idea that starvation could have been a significant contributing factor to the higher number of strandings in 1999 and 2000.

Perryman et al. (2002) found a significant positive correlation between an index of the amount of ice-free area in gray whale feeding areas in the Bering Sea and their estimates of calf production for the following spring; the suggested mechanism is that more open water for a longer period of time provides greater feeding opportunities for gray whales. Unusual oceanographic conditions in 1997 may also have decreased productivity in the region (Minobe, 2002). Regardless of the mechanism, visibly emaciated whales (LeBoeuf et al., 2000; Moore et al., 2001) suggest a decline in the availability of food resources, and it is clear that Eastern North Pacific gray whales were substantially affected in 1999 and 2000; whales were on average skinnier, they had a lower survival rate (particularly of adults), and calf production was dramatically lower. A modeling analysis estimates that 15.3% of the non-calf population died in each of the years of the mortality event, compared to about 2% in a normal year (Punt and Wade, 2010). The most recent abundance estimate from 2015/16 of 26,960 (95% HDPI=24,420-29,830) gray whales (Durban et al. 2017), is above the highest level seen in the 1990s (1997/98 = 21,135 CV = 6.1%) before the mortality event in 1999 and 2000 (Allen and Angliss, 2011).

Subsistence hunters in Washington State, the Bering Strait, and the Russian Federation have traditionally harvested whales from this stock (Allen and Angliss, 2011). In addition to the principles in IWC Schedule paragraph 13(a) that must be followed in setting catch limits, the Schedule, as adopted in 2018, also identifies specific catch limits for 2019 through 2025, with a provision for automatic renewal. IWC Schedule subparagraph 13(b)(2) provides:

> *13(b)(2): The taking of gray whales from the Eastern stock in the North Pacific is permitted, but only by aborigines or a Contracting Government on behalf of aborigines, and then only when the meat and products of such whales are to be used exclusively for local consumption by the aborigines.*
>
> > *(i) For the years 2019, 2020, 2021, 2022, 2023, 2024 and 2025, the number of gray whales landed shall not exceed 980, provided that the number of gray whales struck in any one of the years 2019, 2020, 2021, 2022, 2023, 2024 and 2025 shall not exceed 140, except that any unused portion of a strike quota from the prior quota block shall be carried forward and added to the strike quotas of subsequent years, provided that no more than 50 percent of the annual strike limit shall be added to the strike quota for any one year.*

That is, the annual strike limit will be capped at 140 whales per year and will be shared by the Russian Chukotka people and by the Makah Indian Tribe, subject to the satisfaction of domestic legal requirements under NEPA and the MMPA, with respect to any subsistence hunt by the Makah Tribe. Russian aboriginals harvested 121 (+2 struck and lost) in 1999 (IWC, 2001b), 113 (+2 struck and lost) in 2000 (Borodin, 2001), 112 in 2001 (Borodin et al., 2002), 131 in 2002 (Borodin, 2003), and 126 (+2 struck and lost) in 2003 (Borodin, 2004), while the Makah Tribe harvested one whale in 1999 (IWC, 2001b). Based on this information, the annual subsistence take averaged 122 whales during the five year period from 1999 to 2003. Total takes, including 11 whales struck and lost, by Russian aboriginals were 118 in 2010, 130 in 2011, 143 in 2012, 127 in 2013, 124 in 2014, 125 in 2015, 120 in 2016, and 119 in 2017 (data available from the IWC Secretariat https://iwc.int/home). Based on this information, the annual subsistence take (inclusive of 11 whales struck and lost) averaged 126 whales during the seven year period from 2010 to 2017.

Beluga Whale. Beluga whales (*Delphinapterus leucas*) are distributed throughout seasonally ice-covered arctic and subarctic waters of the Northern Hemisphere (Gurevich, 1980), and some stocks are closely associated with open leads and polynyas (nonlinear openings in the sea ice) in ice-covered regions (Hazard, 1988). Depending on season and region, beluga whales that occur north of the Bering Strait may occur in both offshore and coastal Alaskan waters, with concentrations in areas now designated as separate stocks: eastern Bering Sea, eastern Chukchi Sea, and Beaufort Sea (Muto et al. 2017).

The population abundance estimate for each stock is 19,186 animals in the eastern Bering Sea stock, 20,752 animals in the eastern Chukchi Sea stock, and 39,258 animals in the Beaufort Sea stock (Lowry et al. 2017; Muto et al. 2017). Current population trends for the Beaufort Sea stock is likely stable and may be increasing and eastern Bering Sea stocks and eastern Chukchi Sea stocks are unknown (Muto et al. 2017).

The annual subsistence take by Alaska Natives between 2008 and 2012 averaged 65.6 animals per year from the Beaufort Sea stock, 57.4 animals per year from the eastern Chukchi sea stock, and 181 animals per year from the eastern Bering Sea stock (Muto et al. 2017). Beluga whales are managed by a cooperative agreement under the MMPA by the Alaska Beluga Whale Committee and NMFS.

Minke Whale. Minke whales (*Balaenoptera acutorostrata*) are distributed worldwide. Sightings range from Point Barrow, Alaska, in the Chukchi Sea, through the Bering Sea and Bristol Bay, and in coastal and offshore waters of the Gulf of Alaska (Leatherwood et al., 1982; Mizroch, 1992; Platforms of Opportunity Program [POP], 1997). Few data are available on migratory behavior and apparent "home ranges" of the Alaska stock of minke whales (e.g., Dorsey et al., 1990). Vessel surveys in 1999 and 2000 provided provisional abundance estimates of 810 (CV = 0.36) and 1,003 (CV = 0.26) minke whales in the central-eastern and southeastern Bering Sea, respectively (Moore et al., 2002). These estimates are considered provisional because they have not been corrected for animals missed on the trackline, animals submerged when the ship passed, or responsive movement. Additionally, line-transect surveys were conducted in shelf and nearshore waters (within 30 - 45 nautical miles [n. mi.] of land) in 2001-2003 from the Kenai Fjords in the Gulf of Alaska to the central Aleutian Islands. Minke whale abundance was estimated to be 1,233 (CV = 0.34) for this area (Zerbini et al., 2006). This estimate has also not been corrected for animals missed on the trackline. These surveys covered only a small portion of the Alaska stocks range. Seabird surveys around the Pribilof Islands indicated an increase in local abundance of minke whales between 1975 - 1978 and 1987 - 1989 (Baretta and Hunt, 1994). No data exist on trends in abundance in Alaskan waters (Muto et al. 2017).

Subsistence takes of minke whales by Alaska Natives are rare, but have been known to occur. Only seven minke whales are reported to have been taken for subsistence by Alaska Natives between 1930 and 1987 (C. Allison, IWC, Pers. comm.). A harvest (two whales) in Alaska occurred in 1989 (IWC, 1991).). In 2016, the village of Little Diomede, where climate change has created severe challenges for the bowhead whale harvest, two minke whales were reported taken in 2016.

Humpback Whale. Humpback whales (*Megaptera novaeangliae*) are distributed worldwide in all ocean basins. Humpback whales in the North Pacific are currently found throughout their historic range, with sightings during summer months occurring as far north as the Beaufort Sea (Hashagen et al. 2009) and along the north coast of the Chukotka Peninsula in the Chukchi Sea (Mel’nikov, 2000). Subsistence hunters in Alaska have reported one subsistence take of a humpback whale that was stranded in Norton Sound in 2006 (Allen and Angliss, 2011). There were no reported takes of humpback whales from this stock by Native subsistence hunters in Alaska or Russia in 2010-2014 (Muto et al., 2017). However, in May of 2016 subsistence hunters from Toksook Bay killed a young humpback whale that had wandered into shallow water. This was not an authorized take, as there is no IWC quota for humpback whales and thus, no authorization under the Whaling Convention Act for the harvest of humpback whales by U.S. citizens. Tooksook Bay is not a part of the AEWC. The U.S. reported this humpback whale take as an infraction to the IWC.

The humpback whale ESA listing final rule (81 FR 62259) established 14 Distinct Population Segments (DPSs) with different listing statuses. The DPSs that occur in waters under the jurisdiction of the United States do not necessarily equate to the existing MMPA stocks. Some of the listed DPSs partially coincide with the currently defined Western North Pacific stock. Until such time as the MMPA stock delineations are reviewed in light of the DPS designations, NMFS considers this stock to be depleted for MMPA management purposes (e.g., selection of a recovery factor, stock status). As a result, the Western North Pacific stock of humpback whale is classified as a strategic stock.

Fin Whale. Fin whales (*Balaenoptera physalus*) in the Northeast Pacific stock range throughout the Gulf of Alaska and Bering Sea and north through the Bering Strait into the Chukchi Sea (Muto et al. 2017). Provisional estimates place the stock at 1,368 whales (Friday et al., 2013), increasing at an annual rate of 4.8% (Zerbini et al., 2006). Subsistence hunters in Alaska and Russia have not been reported to take fin whales from this stock. The fin whale is listed as endangered under the ESA, and therefore designated as depleted under the MMPA.

Killer Whale. Killer whales (*Orcinus orca*) have been observed in all oceans and seas of the world (Leatherwood et al., 1982) and are found throughout Alaska waters from the Chukchi Sea to southeast Alaska (Braham and Dahlheim, 1982). They occur primarily in coastal waters, although they have been sighted well offshore (Heyning and Dahlheim, 1988). Seasonal movements in Polar Regions may be influenced by ice cover and in other areas primarily by availability of food. An estimated 2,347 killer whales belong to the eastern North Pacific Alaska resident stock (Muto et al. 2017). Resident killer whales are not known to eat other marine mammals. Population trends for the entire stock are currently unknown though portions of the stock in Prince William Sound and Kenai Fjords have increased 3.2% per year from 1990 to 2005 (Matkin et al., 2008). Transient killer whales are the only known predators of bowhead whales (Angliss and Outlaw, 2005). In a study of marks on bowheads taken in the subsistence harvest, 4.1% to 7.9% had scars indicating the bowhead whales had survived attacks by killer whales (George et al., 1994). A minimum abundance of 587 transient killer whales has been estimated for the Gulf of Alaska, Aleutian Islands, and Bering Sea Transient stock (Muto et al. 2017). There is no reported subsistence harvest of killer whales in Alaska (Muto et al. 2017).

North Pacific Right Whale. The North Pacific right whale is a baleen whale in the Family Balaenidae (right whales). The Marine Mammal Society Committee on Taxonomy recognizes two genera (*Balaena* and *Eubalaena*) in this Family and four species: (1) *Balaena mysticetus* (Bowhead whale, Greenland whale); (2) *Eubalaena japonica* (North Pacific right whale); (3) *Eubalaena glacialis* (North Atlantic right whale); and (4) *Eubalaena australis* (Southern right whale).

North Pacific right whales occur in only parts of the area where the bowhead subsistence hunt occurs, primarily the southern portions of the area. Historic data regarding the habitats used by North Pacific right whales is available from records of both legal (e.g., Maury 1852, Scarff 1991), and illegal (Ivaschenko and Clapham 2012; Ivaschenko et al. 2017) commercial whaling. While close inspection of these historic records has cast doubt on some records, it is clear that the species was widely distributed across coastal and offshore waters of the North Pacific, especially in the Gulf of Alaska south to about 50°N, the southeastern Bering Sea, the northwestern North Pacific, as well as the Okhotsk Sea and Sea of Japan (Cooke and Clapham 2018), with records as far south as Baja California in the eastern Pacific and the Yellow Sea in the western Pacific (Shelden et al. 2005, NMFS 2017). There is uncertainty about whether sighting in certain areas, including southern California and Hawaii, represented vagrants (Shelden 2006) or normal parts of the range, and whether right whales tended to occur in higher abundance in eastern and western areas versus the central parts of the North Pacific (Josephson et al. 2008a). While there is uncertainty about overall current distribution, NMFS (2017, citing Clapham et al. 2004) summarized that the species range has most likely contracted in the North Pacific during the 20th century. Details of modern sightings are provided in NMFS (2017b).

Wright and Clapham (2018) provided a summary of information about the occurrence of North Pacific right whales in the area where the bowhead subsistence hunt occurs, specifically to inform analysis of potential effects of NMFS's proposed action on the North Pacific right whale.

Citing Shelden et al. (2005), Wright and Clapham (2018) noted that North Pacific right whale commercial whaling catches and sightings within the eastern Bering Sea (east of 180°W) ranged from the Aleutian Islands to St. Matthew Island, with limited detections (n<20) farther north. However, some of the more northerly historical sightings were likely either misidentified bowhead whales or represent transcription errors (Scarff 1986). There is essentially no evidence that right whales occur in the Chukchi Sea, and historical records of this species in this area may represent misidentified bowhead whales (Wright and Clapham 2018). Based on recent western scientific monitoring, the likelihood of occurrence of a North Pacific right whale in the Chukchi Sea is extremely small.

Today, the eastern North Pacific right whale population is assumed to occur primarily in and around the federally designated right whale critical habitat within the southeastern Bering Sea , based upon survey effort beginning in the 1980s (Shelden et al. 2005, Munger et al. 2008, Crance et al. 2017, Matsuoka et al. 2017, Mocklin et al. 2018). Wright and Clapham (2018) note that recent sightings of right whales north of St. Matthew Island are rare (Shelden et al. 2005). Since 1980, sightings of right whales in the northern Bering Sea are isolated to a single sighting of two northwest of St. Matthew Island in July 1982 during a research survey (Brueggeman et al. 1984). With the exception of a report by Native hunters in late autumn, confirmed sightings of right whales have not occurred in the northern Bering Sea since then (Shelden et al. 2005, Matsuoka et al. 2017, Mocklin et al. 2018). Furthermore, to date, there have been no confirmed acoustic detections of North Pacific right whales north of 62°N on long-term passive acoustic recorders sampling in the northern Bering, eastern Chukchi, and eastern Beaufort Seas (Wright 2017, Matsuoka et al. 2017, Mocklin et al. 2018). Analysis of long-term passive acoustic recorder data from the eastern Bering shelf (Aug 2012 - Sep 2016) confirms that right whales occur predominantly in the critical habitat, with intermittent detections on the mid-shelf. They were also acoustically detected on a recorder stationed 180 km south of St. Lawrence Island in September 2016 (Wright et al. 2018), indicating that right whales occupy the northern Bering Sea at least briefly and intermittently from May to October (Shelden et al. 2005).

North Pacific right whales were abundant prior to commercial whaling in many parts of the North Pacific Ocean, including parts of the Bering Sea south of the area where the bowhead subsistence hunt occurs. The current abundance of North Pacific right whales is only a small fraction of the abundance of the species prior to commercial exploitation (Cooke and Clapham 2018). Scarff (2001) estimated that 26,500-37,000 right whales were taken (including struck and lost) from 1839-1909, with 21,000-30,000 of these taken from 1840-49. Historical data indicate that the Gulf of Alaska, Aleutian Islands, southern Bering Sea, both coasts of Kamchatka, the Okhotsk Sea, and the northern Sea of Japan were the areas of highest abundance during the summer (NMFS 2017b).

North Pacific right whale abundance and population trend remains uncertain (Cooke and Clapham 2018). A reliable estimate of abundance of the species is lacking, pending a comprehensive analysis of all data available from sighting surveys in the northwestern North Pacific and the Okhotsk Sea (Cooke and Clapham 2018). Based on available data, NMFS (2017b) summarized that the species is one of the most endangered whales in the world, likely numbering fewer than 1,000 individuals between the eastern and western populations. Three recent estimates of abundance of the eastern North Pacific right whale population derived from different kinds of data all indicate the number of individuals in the population is critically low. Based on passive acoustic monitoring, Marques et al. (2011) estimated abundance to be 25 individuals (CV 29.1 percent; 95 percent confidence interval 13–47). Based on mark recapture analysis from the Aleutian Islands and Bering Sea, and based on photo and genetic identification methods, Wade et al. (2011a) estimated abundance for the eastern North Pacific population to be 31 individuals (95 percent confidence interval: 23–54 individuals) and 28 individuals (95 percent confidence interval: 24–42 individuals), respectively. NMFS (2017b) clarified that these abundance estimates refer only to the Bering Sea and Aleutian Islands, but there is little quantitative evidence that the entire eastern North Pacific population is much larger. However subsistence hunters from St. Lawrence Island report seeing large congregations of right whales near the island (George Noongwook, AEWC commissioner for Savoonga, and Edmond Apassingok, AEWC commissioner for Gambell, pers. comm.) but there is no evidence that the entire eastern North Pacific population is much larger. Single or pairs of individuals have also been observed in the Gulf of Alaska over the past couple of decades, as well as two sightings of single whales off California (see NMFS 2017b for more details) and two separate sightings in 2013 off British Columbia (Ford et al. 2016). NMFS (2017b) reported that during the 2017 July-September IWC POWER surveys in the eastern Aleutian Islands and eastern Bering Sea, four new right whale individuals were identified. Additional single sightings are being reported with greater frequency in the last several years, adding to our knowledge of areas where the species may currently occur.

In terms of genetics, LeDuc et al.'s (2012) findings from their genetic analysis of samples from 24 North Pacific right whales supported the contention that the eastern and western populations are largely discrete. Their analysis also suggested that the effective population size of the eastern North Pacific right whale is very small - slightly less than a dozen individuals. Lastly, results from this analysis suggested that the species may have lost some of its pre-depletion genetic diversity. These characteristics increase the extinction risk of the species. There are very few data on which to evaluate vital rates or other basic characteristics of the population (e.g., age structure) of right whales in the eastern North Pacific. Very few calves have been sighted in the eastern North Pacific in several decades (NMFS 2017b, Cooke and Clapham 2018). Other species of right whales calve every three to five years (Knowlton et al. 1994; Kraus et al. 2007). Based on photographic and genotypic survey data collected from 1997-2008 (NMFS 2017), sex ratio in the eastern population is biased (2:5) towards males. This bias would tend to slow recovery compared to an even or female biased sex ratio. Data are not available to determine current age of first reproduction, reproductive intervals, or longevity in this population. Photo-ID analysis by Hamilton et al. (1998) of the extremely well studied eastern North Atlantic right whale population indicates that at least in that species of right whale, age of first parturition for the subset of females with complete sighting histories (n = 13) was 8.7 years.

Harbor Porpoise. Harbor porpoises (*Phocoena phocoena*) are found in the eastern North Pacific Ocean from Point Barrow, along the Alaska coast, and down the west coast of North America to Point Conception, California (Gaskin, 1984; Suydam and George, 1992; Dahlheim et al., 2000). They occur primarily in coastal waters, but are also found where the shelf extends offshore (Gaskin, 1984; Dahlheim et al., 2000). In 1999, aerial surveys were conducted in Bristol Bay resulting in an abundance estimate of 48,215 (CV = 0.223) for this portion of the Bering Sea (Hobbs and Waite, 2010). Currently, there is no reliable information on population trends (Muto et al. 2017).

Subsistence hunters in Alaska are known to occasionally take from this stock of harbor porpoise. Bee and Hall (1956) reported on two entanglements in subsistence nets in Elson Lagoon in 1952. Subsistence fishermen in Utqiaġvik (Barrow), Alaska, state that it is not uncommon for one or two porpoises to be caught each summer (Suydam and George, 1992). In 1991, pack ice may have contributed to the relatively high number (four) of porpoises caught in subsistence nets (Suydam and George, 1992). In 2012, one harbor porpoise entangled in a subsistence salmon gillnet in Nome, Alaska (Helker et al. 2016), resulting in a minimum average annual mortality and serious injury rate of 0.2 harbor porpoise due to subsistence fishery interactions in 2010-2014. When porpoise are caught incidental to subsistence or commercial fisheries, subsistence hunters may claim the carcass for subsistence use (R. Suydam, North Slope Borough, pers. comm.).

3.3.2 Marine Birds

Many species of birds occur in substantial numbers in the Arctic Coastal Plain and Beaufort Sea habitats and nearly all are migratory, present sometime during the period from May to early November. Species include waterfowl, shorebirds, loons, seabirds, hawks and eagles, ptarmigan, and songbirds (MMS, 2002a). Birds hunted by Alaska Natives in Utqiaġvik (Barrow), Kaktovik, and Nuiqsut include the snowy owl, red-throated loon, tundra swan, eiders (common, king, spectacled, and Steller's), ducks, geese, and ptarmigan (MMS, 2002a). Four bird species listed under the ESA and inhabit the areas where Alaska Natives hunt for bowhead whales are Eskimo curlew, short-tailed albatross, spectacled eider, and Steller's eider.

Eskimo curlew. The Eskimo curlew (*Numenius borealis*) was originally listed as endangered under the Endangered Species Preservation Act of 1966 on March 11, 1967 (32 FR 4001). No information on the biology of the species or the threats to it was presented in the listing. No critical habitat has been designated for the species. Eskimo curlews are thought to have once numbered in the hundreds of thousands (Gill et al., 1998). The population declined precipitously and approached extinction in the late 19th century. Spring market hunting in the Midwestern United States during the late 1800s was an important factor contributing to the species' decline. However, Gill et al. (1998) also implicate the conversion of prairie habitat to agriculture, fire suppression, and extinction of the Rocky Mountain grasshopper (*Melanoplus spretus*) in the rapid decline of Eskimo curlew. By 1900, sightings of Eskimo curlews were rare. The last confirmed observation took place in Nebraska in 1987. The only confirmed breeding grounds for the Eskimo curlew occurred in treeless tundra in the Northwest Territories, Canada, but their breeding range probably extended through similar habitats in northern Alaska and possibly eastern Siberia. On June 22, 2011, the USFWS announced their intent to initiate a five-year status review for this species (76 FR 36491). This review was completed on August 31, 2011 and concluded that a change in status was not warranted for the Eskimo curlew (https://ecos.fws.gov/docs/five_year_review/doc3902.pdf). On May 23, 2016, USFWS announced initiation of a five year status review (81 FR 32342) which also concluded no change in status for the species was warranted (https://ecos.fws.gov/docs/five_year_review/doc3902.pdf).

Short-tailed Albatross. The short-tailed albatross (*Phoebastria* (=*Diomedea*) *albatrus*) is listed as endangered under the ESA and by the State of Alaska (65 FR 46643). The short-tailed albatross was originally listed in 1970, under the Endangered Species Conservation Act of 1969, prior to the passage of today's ESA (35 FR 8495). However, as a result of an administrative error (and not from any biological evaluation of status), the species was listed as endangered throughout its range except within the U.S. (50 CFR 17.11). On July 31, 2000, this error was corrected when the USFWS published a final rule listing the short-tailed albatross as endangered throughout its range (65 FR 46643). These birds mate for life, laying eggs in October or November and incubating them for 65 days. The vast majority of individuals of this species breed on only two remote islands in the western Pacific, while individual or a very few pairs have made recent breeding attempts on two other islands, partly as a result of human-mediated range expansion efforts. Chicks leave the nest after five months to go to the North Pacific, including the Bering Sea. Adults also spend the summer at sea, feeding on squid, fish, and other organisms. Most summer sightings of these birds are in the Aleutian Islands, Bering Sea, and Gulf of Alaska. Historical information on the species' range away from known breeding areas is scant. Evidence from archeological studies in middens suggests that indigenous hunters in kayaks had access to an abundant nearshore supply of short-tailed albatross from California north to St. Lawrence Island 4,000 years ago (Howard and Dodson, 1933; Yesner and Aigner, 1976; Murie, 1959). In the 1880s and 1890s, short-tailed albatross abundance and distribution during the non-breeding season was generalized by statements such as "more or less numerous" in the vicinity of the Aleutian Islands (Yesner, 1976). The species was reported as highly abundant around Cape Newenham, in western Alaska (DeGange, 1981). Veniaminof (in Gabrielson and Lincoln, 1959) regarded them as abundant near the Pribilof Islands. Presently, about 4,200 short-tailed albatrosses are known to exist (BirdLife International 2017). Critical habitat has not been designated for this species. On May 20, 2009, the USFWS announced their intent to initiate a five-year status review for this species (74 FR 23739). This review was completed on September 30, 2009, and concluded that no change in status was warranted (https://ecos.fws.gov/docs/five_year_review/doc2623.pdf). On May 5, 2014, the USFWS requested submission of any new information for a five-year status review for the species (79 FR 25613). The completed review, published on September 23, 2014, again recommended no change in status for the short-tailed albatross species (https://ecos.fws.gov/docs/five_year_review/doc4445.pdf).

Spectacled Eider. The spectacled eider (*Somateria fischeri*) is a threatened species under the ESA and is also listed as a species of special concern in Alaska. An estimated 7,370 spectacled eiders occupied the Arctic Coastal Plain of Alaska in June 2001, about 2 percent of the estimated 363,000 world population at that time (MMS, 2002a). Spectacled eiders nest in wet tundra near ponds on the Arctic coasts of Alaska and the Russian Federation and on the coast of the Y-K Delta in Alaska. Nesting pairs arrive together each spring, but the males leave after egg incubation begins. In late summer, the females and young join the males at sea (Alaska Department of Fish and Game [ADF&G], 2001a). The only known wintering area lies south of St. Lawrence Island in the Bering Sea. Because few eiders are observed in marine areas along the Beaufort coast in spring, a majority may migrate to the nesting areas overland from the Chukchi Sea (MMS, 2002a). Spectacled eiders have declined dramatically in Alaska since the 1960s (ADF&G, 2001a, Spectacled Eider). Causes for this decline are not known but may include some combination of reduced food supplies, pollution, overharvest, lead shot poisoning, increased predation, and other causes (ADF&G, 2001a).

The breeding population on the North Slope is currently the largest breeding population of spectacled eiders in North America. The most recent population estimate, uncorrected for aerial detection bias, is 4,744 ± 907 pairs (arithmetic mean plus or minus two times the SE associated with the sample) (Larned et al., 1999). However, this breeding area is nearly nine times the size of the Y-K Delta breeding area. Consequently, the density of spectacled eiders on the North Slope is about one quarter that on the Y-K Delta (Larned and Balogh, 1997; USFWS, 1996; 66 FR 9146). Based on USFWS survey data, the spectacled eider breeding population on the North Slope does not show a significant decline throughout most of the 1990s. The downward trend of 2.6% per year is bounded by a 90% CI ranging from a 7.7% decline per year to a 2.7% increase per year (66 FR 9146). In February 2001, USFWS designated critical habitat on the Y-K Delta, in Norton Sound, Ledyard Bay, and the waters between St. Lawrence and St. Matthew Islands (66 FR 9146). All areas designated as critical habitat for the spectacled eider contained one or more of these physical or biological features: space for individual and population growth, and for normal behavior; food, water, air, light, minerals, or other nutritional or physiological requirements; cover or shelter; sites for breeding, reproduction, rearing of offspring; and habitats that are protected from disturbance or are representative of the historic geographical and ecological distributions of a species. On April 7, 2010, the USFWS announced their intent to initiate a five year status review for this species (75 FR17760). The review published on August 23, 2010, determined that no change in status was warranted for the spectacled eider species (https://ecos.fws.gov/docs/five_year_review/doc3281.pdf). On March 30, 2016, USFWS received a petition requesting that the spectacled eider and Alaska-breeding Steller's eider be delisted due to error in information under the Act. After review of the petition, USFWS determined it did not present substantial scientific or commercial information indicating that the petitioned action was warranted and, therefore, a status review would not be initiated (81 FR 63160).

Steller's Eider. The Steller's eider (*Polysticta stelleri*) is a threatened species under the ESA and an Alaska species of special concern. Steller's eiders are diving ducks that feed on mussels in marine waters during the winter and insect larvae in freshwater ponds during the breeding season of spring and summer. Their current breeding range includes the arctic coastal plain in northern Alaska and northern coastal areas of the Russian Federation, where they nest on the tundra near small ponds (ADF&G, 2001b). In winter, most of the world's population of Steller's eiders ranges throughout the Alaska Peninsula and eastern Aleutian Islands. Aerial surveys provide the only currently available means of objectively estimating Steller's eider population size in northern Alaska. Population size point estimates based on annual waterfowl breeding pair surveys from 1989 to 2000 ranged from 176 to 2,543 (Mallek, 2002). These surveys likely underestimated actual population size, however, because an unknown proportion of birds were missed when counting from aircraft, and no species-specific correction factor has been developed and applied (USFWS, 2002). Nonetheless, these observations indicated that hundreds or low thousands of Steller's eiders occur on the Arctic Coastal Plain. These surveys do not demonstrate a significant population trend from 1989-2000.

The current world population estimate is 150,000 to 200,000 birds, but the population is thought to have declined by as much as 50% between the 1960s and 1980s. When the Alaska breeding population of the Steller's eider was listed as threatened, the factor or factors causing the decline was (were) unknown. Factors identified as potential causes of decline in the final rule listing the population as threatened (62 FR 31748) included predation, hunting, ingestion of spent lead shot in wetlands, and changes in the marine environment that could affect Steller's eider food or other resources. Since listing, other potential threats, including exposure to oil or other contaminants near fish processing facilities in southwest Alaska, have been identified, but the causes of decline and obstacles to recovery remain poorly understood (USFWS, 2002). In February 2001, USFWS designated critical habitat for the Alaska-breeding population of Steller's eiders in one terrestrial and four marine areas: Y-K Delta, Kuskokwim Shoals, Seal Islands, Nelson Lagoon (including

Nelson Lagoon and portions of Port Moller and Herendeen Bay), and Izembek Lagoon (66 FR 8850).

On March 30, 2016, the USFWS received a petition requesting that the spectacled eider and Alaska-breeding Steller's eider be delisted due to error in information under the ESA. After review of the petition, USFWS determined it did not present substantial scientific or commercial information indicating that the petitioned action was warranted and, therefore, a status review would not be initiated (81 FR 63160).

3.3.3 Other Species

Arctic coastal waters support a diverse community of planktonic and epontic species that are prey for fish, birds, and marine mammals. Both marine and anadromous fish inhabit coastal arctic waters. Marine fish include arctic cod, saffron cod, two-horn and four-horn sculpins, Canadian eelpout, arctic flounder, capelin, Pacific herring, Pacific sand lance, and snailfish. Migratory (anadromous) fish common to the arctic environment include arctic cisco, least cisco, Bering cisco, rainbow smelt, humpback whitefish, broad whitefish, Dolly Varden char, and inconnu. Although uncommon in the North Slope region, salmon are present in arctic waters and used by Alaska Natives (MMS, 2002a).

Fish species used by Alaska Natives in Utqiaġvik (Barrow), Kaktovik, and Nuiqsut include Pacific salmon (chum, pink, silver, king, and sockeye), whitefish (round, broad, humpback, least cisco, Bering/Arctic cisco), Arctic char, Arctic grayling, burbot, lake trout, northern pike, capelin, rainbow smelt, arctic cod, tomcod, and flounder (MMS, 2002a).

Terrestrial mammals hunted by Alaska Natives in Utqiaġvik (Barrow), Kaktovik, and Nuiqsut include caribou, moose, brown bear, Dall sheep, musk ox, arctic fox, red fox, porcupine, ground squirrel, wolverine, weasel, wolf, and marmot (MMS, 2002a).

3.4 Socioeconomic Environment

The proposed action has effects on the human environment, notably the 11 member communities of the AEWC. This section describes the population size and ethnic composition, along with a key indicator of economic status, as a basis for the Environmental Justice analysis found in **Section 4.8.5**.

These communities are small, predominantly Alaska Native villages, with the exception of Utqiaġvik (Barrow), as a regional service center, which is larger and more diverse. In 2010, the 11 AEWC communities counted a total 8,258 residents, of whom 6,674 or 80.8 percent are Alaska Native or part Alaska Native (Table 3.4-1). Utqiaġvik (Barrow) accounts for just over half of the total population, and is more diverse, with Alaska Native residents making up 68.6 percent of the community. The most recent population estimates are in the 2012-2016 American Community Survey 5-Year Estimate. Comparing this dataset with the information from the 2010 U.S. Census, five AEWC communities have experienced a decrease in population, while the six other AEWC communities have experience population growth.

Table 3.4-1.
AEWC Community Population and Ethnicity 2000-2010

Community	Total Population (2010)[21]	AK Native Population (2010)[22]	Percent AK Native (2010)[23]	Total Population (2012-2016)[24]	AK Native Population (2012-2016)[25]	Percent AK Native (2012—2016)[26]	Total Population Percent Change (2010-2016)	AK Native Population Percent Change (2010-2016)
Barrow	4,212	2,889	68.60%	4,316	3,043	70.50%	2.50%	5.30%
Little Diomede	115	110	95.70%	55	52	94.50%	-52.20%	-52.70%
Gambell	681	654	96.00%	690	611	88.60%	1.30%	-6.60%
Kaktovik	239	215	90.00%	166	151	91.00%	-30.50%	-29.80%
Kivalina	374	366	97.90%	671	657	97.90%	79.40%	79.50%
Nuiqsut	402	360	89.60%	347	303	87.30%	-13.70%	-15.80%
Point Hope	674	629	93.30%	604	516	85.40%	-10.40%	-18.00%

21 Source: U.S. Census, 2010.
22 See footnote 17, above.
23 See footnote 17, above.
24 Source: American Community Survey 5-Year Estimates for 2012-2016.
25 See footnote 20, above.
26 See footnote 20, above.

Point Lay	189	168	88.90%	306	273	89.20%	61.90%	62.50%
Savoonga	671	637	94.90%	932	878	94.20%	38.90%	37.80%
Wainwright	556	510	91.70%	488	467	95.70%	-12.20%	-8.40%
Wales	145	136	93.80%	166	155	93.40%	14.50%	14.00%
Total	8,258	6,674	80.80%	8,741	7,106	81.30%	5.80%	6.50%

Sources: U.S. Census - Profile of General Population and Housing Characteristics: 2010; American Community Survey 5-Year Estimates for 2012-2016.

The most current information concerning income and poverty levels is the 2012-2016 American Communities Survey 5-Year Estimate. While it is the best information available, there is a significant margin of error for each estimate and the data should be taken with caution. Table 3.4-2 shows that, using the federally defined poverty level, two of the AEWC communities have low levels (less than 10 percent of residents), while three communities have intermediate rates (10-18 percent of residents). The remaining six communities have higher rates, ranging from 23.7 percent through 52.7 percent of residents living below the poverty level. The available data suggests that population declines may be based on decreased economic activity for these communities. All but two of these communities exceed the average rate of Alaska residents living below the poverty level, which is 10.1 percent, and in many cases these rates are two and three times the Alaska average.

Table 3.4-2.
Portion of AEWC Community Residents Living Below Poverty Level

Community	Individuals Below Poverty Level (2012-16)
Barrow	14.1%
Little Diomede	52.7%
Gambell	43.7%
Kaktovik	3.8%
Kivalina	26.4%
Nuiqsut	6.4%
Point Hope	17.4%
Point Lay	23.7%

Savoonga	47.3%
Wainwright	16.4%
Wales	37.2%
State of Alaska Rate*	10.1%

Source: 2012-2016 American Community Survey 5-Year Estimates.

3.5 Inuit Tradition of Subsistence Hunt of Bowhead Whales

Bowhead whale hunting has been a part of Alaska Native culture for at least 2,000 years (Stocker and Krupnik, 1993). Subsistence hunting communities along the western and northern coasts of Alaska participate in annual bowhead whale hunts and rely on the hunts for both cultural and nutritional needs (Braund et al., 1997). Historically, residents of the villages participate in one or more of the semi-annual hunts (Stocker and Krupnik, 1993). This section describes the importance of the ongoing bowhead subsistence hunt, in relation to the overall pattern of subsistence production, in its key social organization features, and as a foundation of Iñupiat and Siberian Yupik cultural identity and ceremonial life.

As explained by George Noongwook, a whaling captain from Savoonga and former Chairman of the Alaska Eskimo Whaling Commission:

> *"Subsistence whaling is a way of life for the Inupiat and Yupik people who inhabit the Western and Northern coasts of Alaska. From Gambell to Kaktovik, the bowhead whale has been the center of our culture for centuries and our people are reliant on its abundant meat to feed their families and our communities.*
>
> *The bowhead whale is a significant resource that draws generations of Eskimos together and ensures our way of life will flourish into the future. As Alaska's first people, we are deeply connected to the land, the sea, and the resources of the area, and each is essential to our sense of identity and to our continued vitality. Through whaling, we express that connection and pass it on to the next generation along with the responsibility of sharing the food we harvest to provide for the needs of the entire community.*
>
> *To our people, the bowhead is more than food. It keeps our families together. It keeps our children in school. It allows our elders to pass generational knowledge to our youth. It teaches us patience and perseverance. It teaches us generosity. It strengthens our*

community. It provides wisdom and insight. It gives us hope. It is our way of life. The spirit of the whale lives within each of us."

Bowhead subsistence whaling represents an especially important source of subsistence food among the AEWC communities. During the period of 2007 to 2017, the AEWC villages have landed 447 bowhead whales, or an average of 40.6 whales per year. As shown in Table 3.5- 1, the largest AEWC community of Utqiaġvik (Barrow) takes just under half of the total, with an average of 19.7 bowhead whales landed per year in the last decade. Most of the rest of the communities take one to five whales per year, while the small communities of Wales and Point Lay have highly intermittent harvests, and Kivalina and Little Diomede have taken no bowhead whales in this period.

Table 3.5-1

Bowhead Whales Landed by AEWC Communities in 2007 - 2017

	Gambell	Savoonga	Wales	Little Diomede	Kivalina	Point Hope	Point Lay	Wainwright	Barrow	Nuiqsut	Kaktovik	Total
Total Landed	28	40	1	0	0	48	5	42	217	35	31	**447**
Annual Average	2.5	3.6	0.1	0	0	4.4	0.4	3.8	19.7	3.2	2.8	**40.6**

Bowhead whales provide exceptionally large quantities of high-quality food. During the late 1980s, a method was developed to estimate the edible pounds produced from bowhead whales of various sizes (Braund and Institute of Social and Economic Research [ISER], 1993). After weighing crew shares of *maktak* and meat from a number of harvests in Utqiaġvik (Barrow), the authors established the average pounds of food produced per foot of length for small, medium, and large bowhead whales.

Additional facets of the importance of bowhead whale within the total annual round of subsistence harvests can be shown through the comprehensive household surveys, conducted in the period from 1987 through 2007, and reported in the ADF&G Subsistence Division subsistence harvest database. Surveys of this sort permit a broad comparison of the variation in bowhead harvest levels between participating communities and of the variation in the proportion of bowhead food in relation to other major subsistence resources. However, the data are limited in that some studies are dated (such as Point Lay data for 1987 and Wainwright data for 1989). A single year from the ADFG Subsistence Division database was selected to provide a single point in time comparison among the communities. Where more than a single study year was available, the most recent year was selected. As displayed in **Table 3.5-3**, per capita harvest levels for bowhead whales, during the years studied, ranged from as high as 560 pounds in Kaktovik in

1992, to about 100 pounds per capita in Utqiaġvik (Barrow), and no bowhead harvest in Kivalina in 2007 or Wales in 2006.

Total subsistence production levels also varies among the communities, with the more heterogeneous community of Wales having the lowest annual per capita production total at 353 pounds, while the other ranged from 361 pounds to 1,110 pounds during the study years. When viewing the subsistence harvest survey data shown in **Table 3.5-3**, it is important to note that bowhead subsistence harvests vary from year to year, particularly for some of the smaller communities, so these results are indicative, and do not define a stable pattern. With the exception of Kivalina and Wales, surveyed in 2007 and 2006 respectively, the period covered in these community harvest studies had lower bowhead harvest levels, on the whole, than those of the past decade. From 1987 through 1993, years of highly restrictive IWC quotas set below documented subsistence need, AEWC communities averaged 28.6 bowheads whales landed per year. In the past decade, with IWC quotas set at a level more consistent with documented subsistence need, the average has been 40.6 bowhead whales landed per year.

Table 3.5-2.
Community Subsistence Harvest Levels by Species Group (Pounds per Capita)

Village	Bowhead whale	Other marine mammals	Game	Fish & marine invertebrates	Birds & eggs	Vegetation	Total
Barrow 2014	102.75	89.35	111.96	47.87	9.42	0.56	361.91
Kaktovik 1992	560.35	38.78	148.71	118.91	16.83	1.18	884.76
Kivalina 2007	0	291.20	90.20	183.20	10.20	18.70	593.70
Nuiqsut 2014	356.63	51.25	260.95	214.32	11.70	1.00	1110.8
Point Hope 2014	164.19	151.74	34.19	83.41	12.32	5.26	451.11
Point Lay 2012	170.36	147.16	187.73	53.12	30.70	5.77	594.84
Wainwright 1989	218.23	302.27	178.18	37.15	15.41	ND	751.24
Wales 2006	0	215.45	26.01	103.69	3.63	4.78	353.56

Source: ADF&G, 1989, 1992, 2006, 2007, 2012, 2014; Fuller and George, 1997. ND = no data

In addition to this high reliance on bowhead whales, Iñupiat and Siberian Yupik communities harvest many species throughout an intricate annual cycle of subsistence activities. The species composition of subsistence harvests in selected AEWC communities gives an indication of the flexible adaptation of subsistence patterns to ecological patterns of abundance and access to various resources. For example, while bowhead, caribou, and fish make up the majority of subsistence foods in most of the Iñupiat communities, the Chukchi Sea communities rely more heavily on walrus and seal than do the Beaufort Sea villages (MMS, 2006a:168). In **Table 3.5-5**, the communities of Kaktovik and Nuiqsut have high proportions of total subsistence food derived from the bowhead harvest, and lower proportions from other marine mammals, while the communities of Wainwright, Kivalina, and Wales show much greater harvests of other marine mammals.

Table 3.5-3.
Proportion of Subsistence Food Provided by Taxa

Village	Bowhead whale	Other marine mammals	Game	Fish & marine invertebrates	Birds & eggs	Vegetation	Total Percent
Barrow 2014	28.4%	24.7%	30.9%	13.3%	2.6%	0.2%	100.0%
Kaktovik 1992	63.3%	4.4%	16.8%	13.4%	1.9%	0.1%	100.0%
Kivalina 2007	0%	49.0%	15.2%	30.8%	1.7%	3.1%	100.0%
Nuiqsut 2014	39.8%	5.7%	29.1%	23.9%	1.3%	1.0%	100.0%
Point Hope 2014	36.4%	33.6%	7.6%	18.5%	2.7%	1.2%	100.0%
Point Lay 2012	28.6%	24.7%	31.6%	8.9%	5.2%	1%	100.0%
Wainwright 1989	29.0%	40.2%	23.7%	4.9%	2.1%	ND	100.0%
Wales 2006	0%	59.7%	7.2%	28.7%	1%	1.3%	100.0%

Source: ADF&G 1989, 1992, 2006, 2007, 2012, 2014; Fuller and George, 1997. ND = no data

Households in the AEWC communities have very high rates of participation in production and consumption of bowhead subsistence foods. The comprehensive household surveys also documented the percentage of households using bowhead, trying to harvest, actually harvesting, receiving bowhead food from others, and giving bowhead food to other households. As seen in

Table 3.5-7, for the six smaller communities with data, 5 percent - 98 percent of households use bowhead whale foods. Note too that this is the result of widespread sharing of food, since a rather small proportion of households (0-22.9 percent) has actually harvested bowhead whales in the study years. In the larger community of Utqiaġvik (Barrow), the importance of resource sharing is even more pronounced, with only 12% of households harvesting bowhead while 70% of households use bowhead for food. More detailed accounts of the subsistence harvest patterns of Kaktovik, Nuiqsut, Utqiaġvik (Barrow), Wainwright, and Point Hope are found in Appendix C of MMS (2006a). In another important recent summary, Braund (2010) provided detailed harvest survey and subsistence use area mapping for Utqiaġvik (Barrow), Nuiqsut, and Kaktovik.

Table 3.5-4.
Rates of Participation in Bowhead Subsistence Activities

Village	Using Bowhead	Attempting to Harvest	Harvesting	Receiving Bowhead from Others	Giving Bowhead to Others
Barrow 2014	69.9%	24.3%	12%	67.2%	42.5%
Kaktovik 1992	87.2%	53.2%	6.4%	85.1%	61.7%
Kivalina 2007	64.3%	47.6%	0%	64.3%	16.7%
Nuiqsut 2014	93.1%	29.3%	20.7%	91.4%	56.9%
Point Hope 2014	98.1%	62.9%	22.9%	97.1%	65.7%
Point Lay 2012	85.7%	38.1%	2.4%	83.3%	59.5%
Wales 2006	5.1%	0%	0%	5.1%	0%

Source: ADF&G 1989, 1992, 2006, 2007, 2012, 2014. ND = no data

Subsistence harvests occur within traditional use areas, for which hunters have accumulated detailed knowledge of the physical geography of landscape and waters, the social geography of place names and the associated stories, and the wildlife ecology of likely animal distributions by seasons and under varying weather conditions. Hunters have a repertoire of effective harvest strategies to draw upon as they hunt throughout these traditional harvest areas. Bowhead subsistence whaling occurs in U.S. waters primarily during the spring and autumn migrations as the bowhead whales move north and east through near shore leads in the spring, and then west and south as ice forms in the autumn. The bowhead migration patterns are conducive to spring harvests for westerly AEWC communities, while Utqiaġvik's (Barrow's) location provides for successful spring and fall hunts, and the villages of Nuiqsut and Kaktovik participate in the fall hunts. The St. Lawrence Island communities of Gambell and Savoonga typically take bowhead whales in the early spring as well as in the later part of the fall migration, continuing as late as December. With changes in sea ice and bowhead whale abundance, these communities are beginning to continue their harvests into January and February.

AEWC residents can travel offshore great distances to find and pursue bowhead whales during both fall and spring harvests. The best available data on the extent of bowhead hunting activities are subsistence use area maps for several AEWC communities, based on resident surveys conducted by Braund and Associates in 2006. The subsistence use areas (**Figure 3.5-1**) represent the historical hunting range for AEWC communities over the ten-year period (1996 - 2006) prior to the surveys. Within each community, there is considerable inter-annual variation depending upon the location of bowhead whale migration and weather and sea ice conditions (Braund 2010). For example, in Utqiaġvik (Barrow), hunters indicated that ice leads were closer to shore in the year prior to the survey, greatly reducing the travel distances required to harvest bowhead whales relative to previous years' harvests. While hunters preferred to harvest bowhead whales closer to the community to prevent meat from spoiling, they were also willing to travel 48 – 80.5 km (30 - 50 mi.) offshore or away from the community for harvests if necessary. At times, those participating in the harvest reported that oil and gas exploration activities, including drilling ships, disturbed bowhead whale activities, forcing both the whales and hunters to go further offshore (Braund, 2010). For more detailed information on bowhead subsistence use areas and harvest inter-annual variation within the communities of Utqiaġvik (Barrow), Nuiqsut, and Kaktovik, see Braund (2010).

As described in Bacon et al. 2013, sharing of subsistence foods among individuals and households is an important part of the subsistence culture on the North Slope and in some villages there are persons who hunt for many people other than themselves. In all villages surveyed, active hunters routinely shared with elders and other households (Bacon et al. 2013). Subsistence activities are often centered in family groups, with widespread sharing of financial resources and equipment to support hunters, sharing of labor in harvesting, processing and distributing subsistence foods, and sharing of knowledge as elders provide practical information and ethical understandings for successful subsistence pursuits. The social organization of subsistence activities binds generations and families together across and even between communities. Subsistence whaling and the roles of whaling captains and whaling crews are especially prominent in the social organization of the Iñupiat and Siberian Yupik whaling communities. The wives of whaling captains and whaling crewmembers also have an intricate set of interlinked responsibilities. These are particularly important in the preparation of bearded seal (*ugruk*) skins for the *umiaks*, still preferred in Utqiaġvik (Barrow) for the spring hunts due to their light weight, durability, and silence in the water (see Bodenhorn, 2000 for additional discussion). From aboriginal times, the whaling captain, or *umailik*, was recognized as a leader for his knowledge, success at hunting, support for the needs of his whaling crews throughout the year, and generosity in sharing the fruits of a successful hunt. Cooperation among whaling crews was critically important in the success of any hunt, and customary laws prescribed how a captain would distribute portions of the whale to the crews that helped in the capture as well as to the entire community (Worl, 1979).

To further explore and illustrate the extent of substantial contributions of social relations unique to whaling in two AEWC communities, BurnSilver et al. 2016 constructed valued and directed multiplex social networks in which households, whaling crews, and other organizations were connected through flows of food and non-food items. As noted in BurnSilver et al. 2016, the three main elements of mixed economies -- (1) market exchange, (2) subsistence activities, and (3) culturally embedded social relationships sustained by flows of wild food and other resources -- have proven persistent, rather than transitional, in Wainwright and Kaktovik (cf. BurnSilver et al. 2016).

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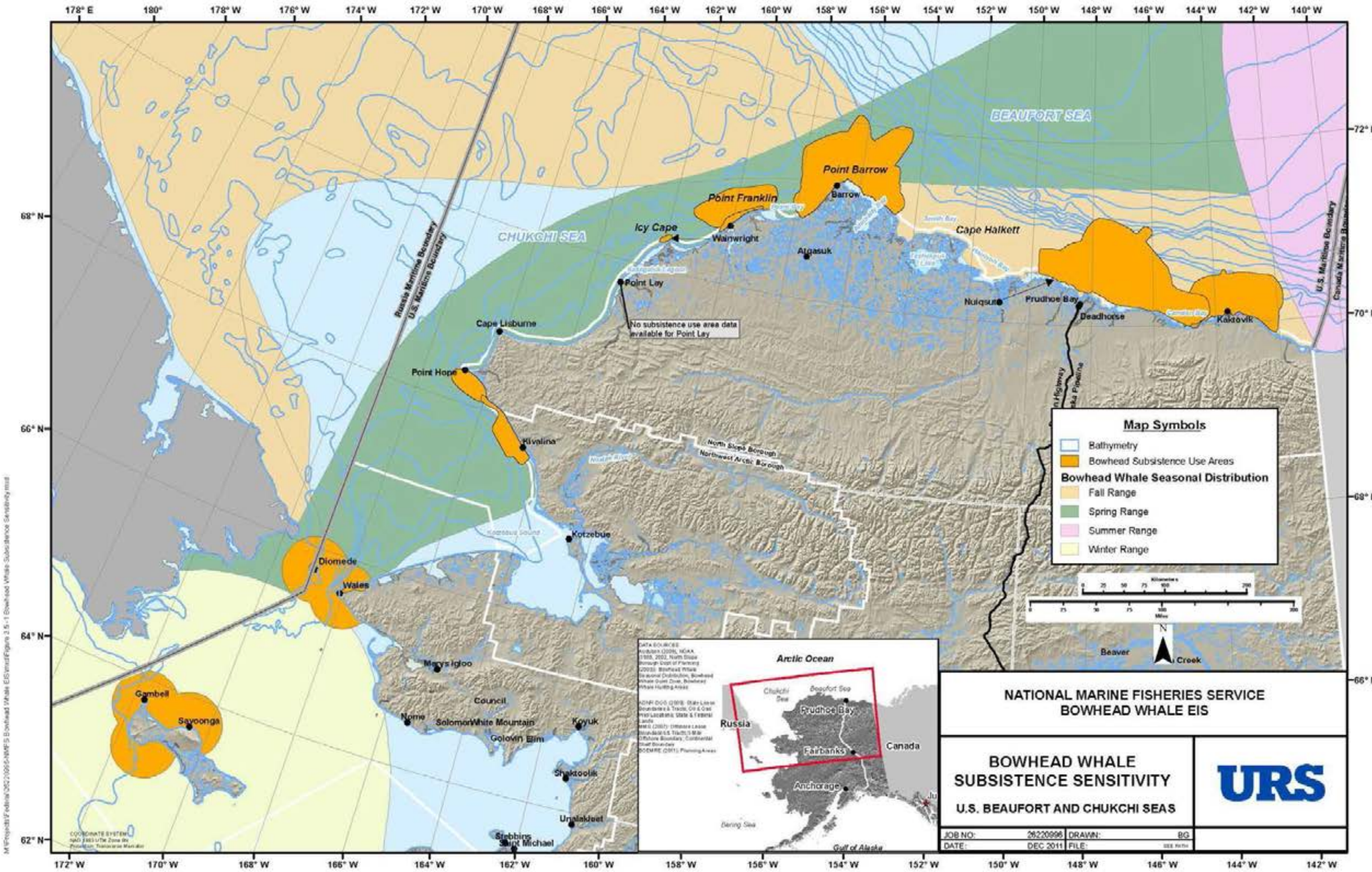

Figure 3.5-1. Bowhead whale subsistence use areas. U.S. Beaufort and Chukchi Seas. 2011.

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Hauling a whale onto the ice edge and processing the enormous amount of food provided required the cooperative labor of virtually the entire community. This remains true today.

In addition to the widespread sharing of bowhead whale foods, the nonedible parts of the whale such as baleen and bone are also valuable for craftwork. No specific data are available on the quantities of baleen and bone distributed within and between communities. However, representatives of the AEWC and the Iñupiat History, Language and Culture Commission (IHLC) provided an overview of these sharing and distribution patterns (Harry Brower Jr., Pers. comm., 2007; Dorcus Stein, Pers. comm., 2007). The whaling captains retain half of the baleen and bone, and distribute the remainder to the whaling crew. Captains and crewmembers share these materials with others in their communities and beyond. Some communities on the North Slope, the Bering Sea coast, and Norton Sound do not have access to bowhead whales, but value the baleen and bone as raw materials for use in making handicrafts. Craft producers may contact a whaling captain and offer to trade subsistence foods for such raw materials. A whaling captain might also take an interest in baleen craft courses at schools in the NSB and provide the raw materials for use in the class to support continuation of the artistic traditions. Craft production is widespread and important to Iñupiat and Yupik communities.

Spiritual and moral values, beliefs, and cultural identity are expressed and recreated through subsistence harvest activities. The great gifts of food from bowheads are recognized in the ceremonies of the *Nalukatak* festival at the conclusion of spring whaling.

Since the late 1970s, subsistence bowhead whaling has been governed in the formal structures of international treaties, national legislation, and the Cooperative Agreement between NOAA and the AEWC. Beginning in 1977, the IWC adopted catch limits for bowhead whale harvests, after considering the nutritional and cultural need for bowhead whales by Alaska Natives and the level of harvest that is sustainable.

Around the same time, the IWC passed a resolution calling for further research on the cultural and nutritional needs of Alaska Eskimos to hunt bowhead whales (Alaska Consultants, Inc. and Stephen R. Braund & Associates 1984, Braund 1992). The USDOI oversaw that research, which included the support and participation of the AEWC. A 1982-1983 survey in nine whaling communities documented and established the cultural importance of bowhead whales to Alaska Eskimos (*Subsistence Study of Alaska Eskimo Whaling Villages* [Alaska Consultants, Inc. and SRB&A 1984]); however, it did not quantify the number of bowhead whales necessary to fulfill that need. Subsequent research was conducted to develop a method to quantify the subsistence and cultural need for bowhead whales (USDOI 1980, U.S. Government 1983), and the resulting method was further developed and refined in *Quantification of Subsistence and Cultural Need for Bowhead Whales by Alaska Eskimos* (Braund et al., 1988). The method developed in these reports was accepted by the IWC, resulting in a quota of 41 landed bowhead whales in 1988, and this method has been used in subsequent years to update the quota. While the IWC granted an overall quota for Alaska Eskimo whaling communities, it was left to the AEWC to decide how to divide that quota among individual communities.

The method and documentation accepted in 1988 to quantify Alaska Eskimo need for bowhead whales was based on 1) historic bowhead harvest levels (for a “base period” of 1910-1969), and 2) Eskimo populations in whaling communities. Using historic harvest levels and Eskimo populations during the base period, the 1988 report established a per capita need for bowhead whales for each whaling community. Applying this method, determination of current need for bowhead whales, per capita harvests, by village, are multiplied by current Alaska Eskimo populations per village (as documented by the U.S. Census Bureau). Thus, the quantification of need takes into account only the population size within each whaling village (Braund, 2018).

A revised calculation of need was submitted to the IWC in 1994, based on July 1, 1992 human population data generated by the State of Alaska, Department of Labor. The next revised calculation, submitted to the IWC in 1997, used the same per capita method accepted by the IWC, presenting revised calculations based on July 1, 1997 human population data generated by the State of Alaska, Department of Labor (Braund et al., 1997). This accepted methodology was used for the need statement submitted to the annual IWC meeting in 2002. This need statement demonstrated a documented nutritional and cultural need for 56 landed bowhead whales per year.

Subsistence need was not recalculated for 2018. Instead, the U.S. submitted to the IWC a document, *The Description of Alaskan Eskimo Bowhead Whale Subsistence Sharing Practices, including an Overview of Bowhead Whale Harvesting and Community-Based Need* (see **Appendix 8.1**). With this study, the AEWC provides documentation of the sharing practices that support and surround the bowhead whale harvest, and provide a broader cultural view of both the concept and the physical reality of need. The study retained described the calculation of need, using the accepted methodology, based on the 2010 census, which produced a landed need of 57 bowhead whales. The study further outlined the reasons why this accepted methodology represents an underestimation of need, including the lack of considering the traditional practice of sharing bowhead whale as a part of the Alaska subsistence sharing economy. Future work may be undertaken to determine how best to incorporate the sharing component of need into the methodology for need calculation used since the 1980s.

3.5.1 Methodology of Subsistence Hunts for Bowhead Whales

The hunting of bowhead whales by Alaska Natives is believed to date back several thousand years with the use of harpoons and lances fashioned from stone, ivory, and bone. Seal or walrus skin-covered whaling vessels known as *umiaks* were employed from aboriginal times and remain the most commonly used vessel for the spring hunt (Stocker and Krupnik, 1993). Starting in the early 1930's, Alaska Native residents of Utqiaġvik (Barrow) also incorporated engine-powered boats for fall whaling activities (IWC 1982). Crew sizes currently average six persons per vessel (Rexford, Pers. comm., n.d.) Before the whales arrived during each migration, ritual ceremonies were performed in special houses known as *karigi*, to ensure a successful hunt and to honor the whale (Ellis 1991).

Alaska Natives continue to use traditional methods to take whales today, but have also incorporated Yankee whaling era technologies such as darting and shoulder guns as a method of improving efficiency and humane killing methods (Stocker and Krupnik 1993). The "darting gun" is used first, as it has a harpoon with line and float attached, to deliver an exploding projectile. The harpoon line and float allows a whale to be pursued and located. Under the AEWC Management Plan, a harpoon must be used to attach a float to a whale before it can be shot. Once the darting gun is thrown, the shoulder gun is often used as a secondary weapon.

Contemporary hunts occur twice a year in the spring and autumn seasons based on ice and weather conditions. Some communities hunt only in the spring (i.e., Wales, Little Diomede, Kivalina, Point Hope, and Point Lay), some only hunt in the autumn (i.e., Nuiqsut and Kaktovik) and others hunt in spring and autumn/winter (i.e., Gambell, Savoonga, Wainwright, and Barrow. In the autumn season, aluminum skiffs or small open boats with outboard motors are used for the hunt due to the open water conditions. In the spring, traditional skin- covered *umiaks* are preferred because they are durable, lighter to transport, and quieter, therefore more effective in the ice leads. Spring hunts are logistically more difficult than autumn hunts because of challenging and dynamic environmental conditions, difficulty in accessing open water, and changing sea ice thickness and dynamics (Suydam et al. 2017). The hunting efficiency during spring is usually lower than autumn (Suydam et al. 2017).

Traditionally, most of the whale was used for food, though other parts of the whale were used to make whaling gear, fishing equipment, traps, tools, and for many other practical day-to-day uses (Ellis 1991). The gut was made into translucent windows, and the oil was used for heating, cooking, lighting, and traditional drumheads (Ellis 1991). The bones were used for fences, house construction, and sled runners (Ellis 1991). Baleen and bone are used in many forms of handicraft, including baleen baskets, scrimshaw, and carvings.

Today, bowhead is still an important source of subsistence food, where the skin and blubber, known as *maktak*, are eaten raw or boiled in salted water (Ellis, 1991). Subsistence foods also include muscle, flukes, flipper, tongue, intestines, heart and kidney, as well as stomach and liver in Point Hope. Blood is used in *migiyaq* (fermented meat and blubber). The membrane on the liver is used for drum skins. The tympanic or 'ear' bones are kept by the captains and prized by family members, and used for artwork (Craig George, North Slope Borough, Pers. comm., December 20, 2007).

In recent years, the AEWC has focused on improving humane killing methods (e.g., reducing time to death) and the efficiency of the hunt (e.g., struck to landed ratio), including developing a highly successful Weapons Improvement Program (WIP) that reports annually to the IWC's Humane Killing Working Group. The primary objectives of the program are:

- Improving the reliability and safety of the weapons, including development of the penthrite projectile to replace the black powder explosive;
- Hunter safety;
- Ensuring humane harvest of the bowhead whale; and
- Increasing the efficiency of the harvest by landing a higher percentage of struck whales.

3.5.2 Results of Recent Hunts

Since 1981, the North Slope Borough Department of Wildlife Management (NSB DWM) has gathered basic data on landed whales in several communities and assists the AEWC with compilation of statistics on landed and struck and lost whales (Albert, 1988). Suydam and George (2018) summarize Alaskan subsistence harvests of bowheads from 1974 to 2016. Hunters from the 11 AEWC villages, and one additional village, landed 1,373 whales from 1974 to 2016. Utqiaġvik (Barrow) consistently landed the most whales (n = 700) while Shaktoolik landed one whale (prior to the formation of the AEWC), and Little Diomede landed two whales (Figure 3.5.2-1). Shaktoolik, a village located on the coast of Norton Sound, Alaska, harvested one whale in 1980 but has not been a regular participant in the hunt and is not an AEWC community. Little Diomede harvested one whale in 1999 and another in 2005, Point Lay became a member of the AEWC and has harvested a whale regularly since 2009 (Suydam and George, 2018). The number of whales landed at each village varied greatly from year to year (**Figure 3.5.2-1**), as success was influenced by village size and ice and weather conditions. The annual average subsistence take during the five year period from 2006 - 2010 is 38 bowhead whales (which also includes whales taken by Russian aboriginal hunters) (Allen and Angliss, 2011). The 2017 harvest of 50 whales was slightly higher that the recent average (Suydam et al. 2018).

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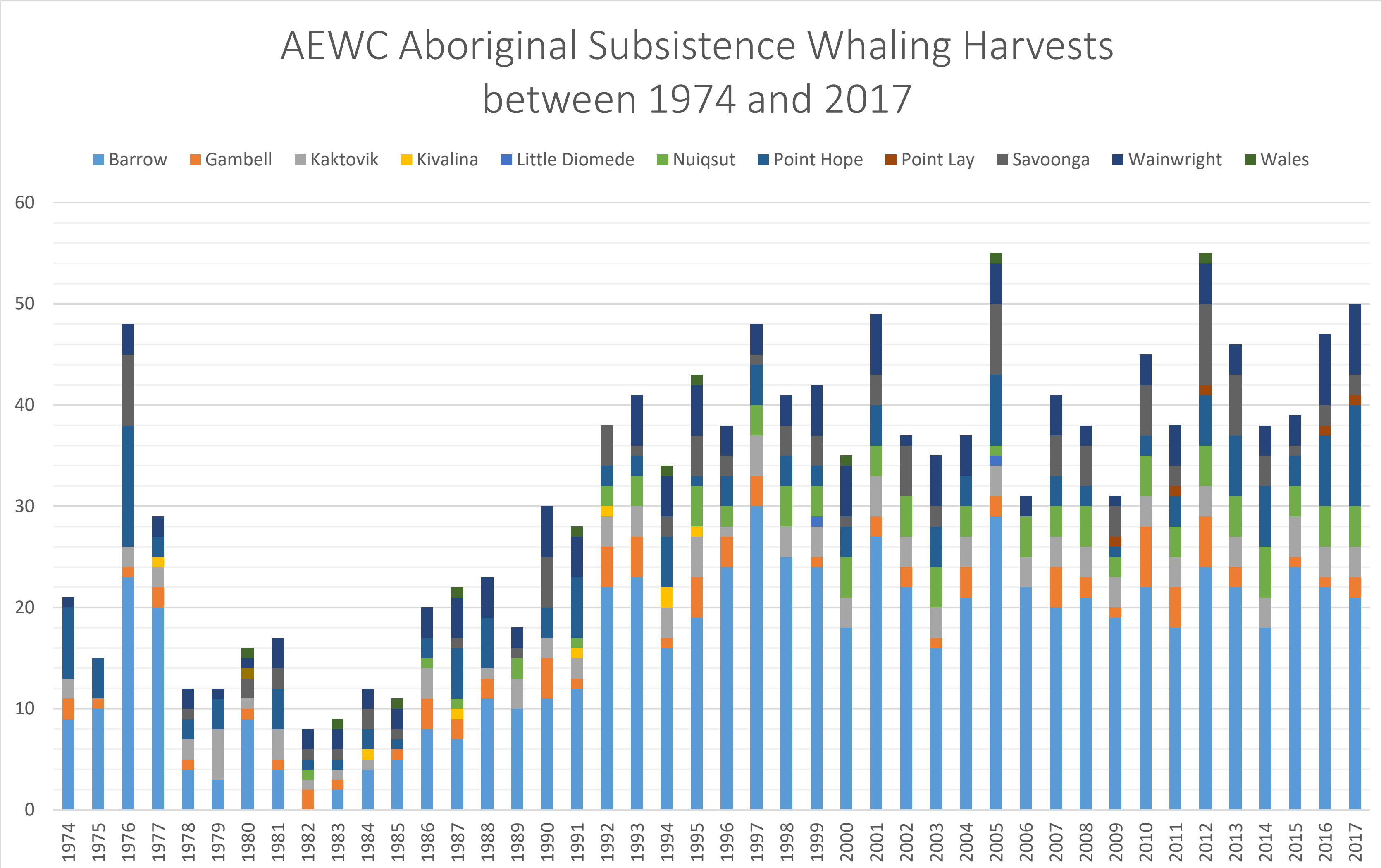

Figure 3.5.2-1. Summary of the number of bowhead whales landed by year in each village[27] between 1974 and 2017. Data were collected by the Alaska Eskimo Whaling Commission, the North Slope Borough and the National Marine Fisheries Service.

[27] Point Lay became a member of the AEWC in 2008 and landed its first whale in more than 70 years in 2009.

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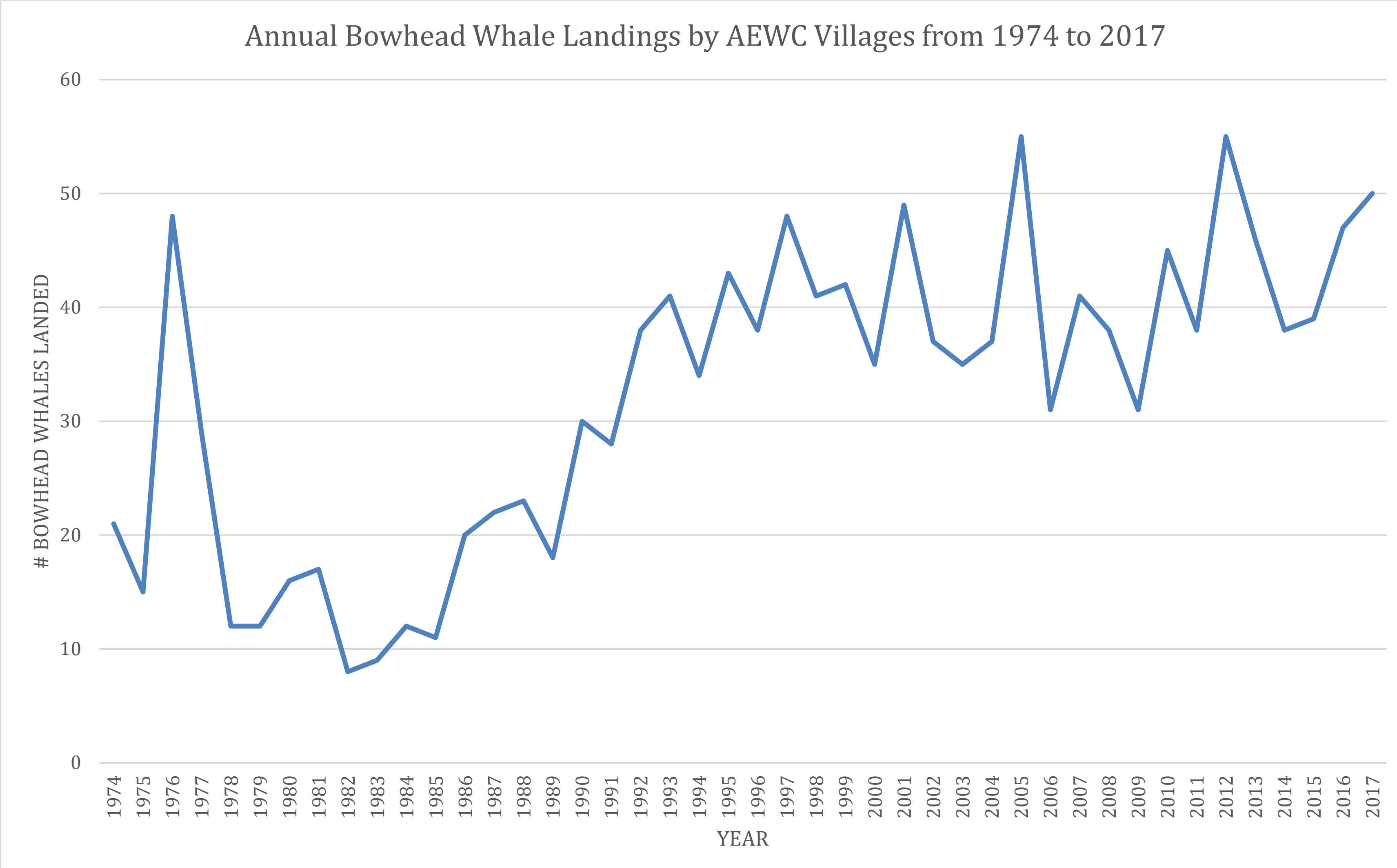

Figure 3.5.2-2. Total of Western Arctic bowhead whales landed by AEWC villages from 1974-2016. Source: Suydam and George 2018. Data were collected by the Alaska Eskimo Whaling Commission, the North Slope Borough and the National Marine Fisheries Service.

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Thinning, earlier thawing, and stability of shorefast ice, as well as weather conditions, are affecting the spring hunts, with Wainwright, Point Lay, and Point Hope expressing interest in the fall hunts, due to increasingly difficult conditions in the spring. Wainwright landed two whales in the fall, in 2010 and 2011 (Suydam and George, 2012). Additionally, Gambell and Savoonga are increasingly hunting during the winter because of difficult spring conditions (Suydam and George 2018). A report prepared by the AEWC and submitted by the U.S. to the IWC (AEWC and U.S. Government, 2012) elaborated on the effects of climate change:

> *The rapid advance of climate change in the Arctic also is having a dramatic impact on this hunt, as thinning sea ice increases the difficulty of reaching the edge of the shore-fast ice and creates an unstable and dangerous platform for conducting the hunt in the spring lead system. The thinner, less stable ice has greatly increased the danger in this already treacherous hunt and has increased the difficulty of landing whales that must be pulled onto an ever-thinner ice edge, which is subject to shifting and cracking under the weight of the whales. With the ice changes, the bowhead whale subsistence hunt at St. Lawrence Island, historically a spring hunting location, has shifted to winter months, with a number of whales now taken between November and March.*

The efficiency of the hunt (i.e., the number of whales landed compared to the number of whales struck) has increased since the implementation of the bowhead subsistence whaling catch limit in 1978. From 1973 to 1978 the efficiency was about 50%; in the last ten years (i.e., 2007-2016) efficiency has averaged 75.2% (**Figure 3.5.2-2**) and 2017 was 88%, near the highest level recorded (Suydam et al., 2018). The fall hunting conditions are generally better, with more open water, so the sea ice is less of an influence on harvest efficiency (Suydam et al., 2011).

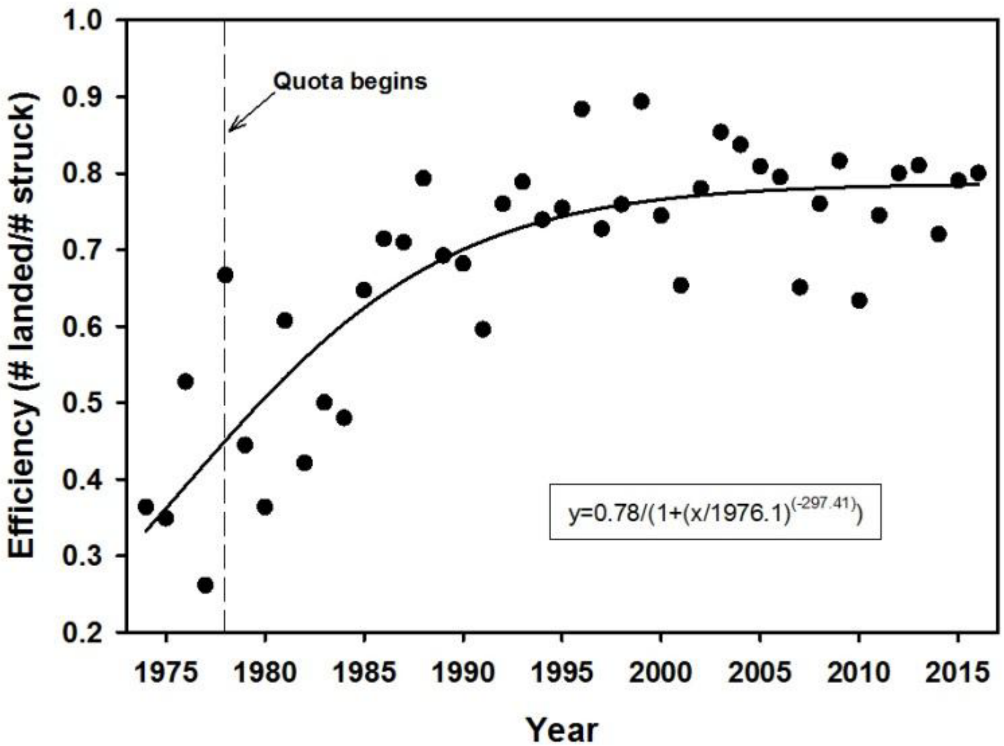

Figure 3.5.2-3. Efficiency of the Western Arctic bowhead whale subsistence hunt, 1973- 2016. Source: Suydam et al. 2018.

In a technical report submitted to the Scientific Committee of the IWC, Suydam et al. (2018) reported that the 2017 efficiency was 88 percent, which is higher than the average efficiency over the past 10 years (2007-2016: mean of efficiency = 75.2%; SD =6.5%). In addition, this report summarized the factors leading to improved efficiency over the years as follows:

(1) Enhanced training conducted by senior captains of the AEWC on where to strike a whale,
(2) Improved communication for alerting other crews that a whale had been struck,
(3) Efforts by some captains to only strike smaller whales,
(4) Enhanced efforts to locate and retrieve struck whales using (a) aircraft to spot struck whales and (b) dive teams to help retrieve whales that sank, and
(5) Establishment of a program to improve the weaponry.

The United States, on behalf of the AEWC, reports regularly to the IWC's Whale Killing Methods Working Group on the AEWC's progress with the penthrite projectile and the Weapons Improvement Program. The AEWC report on weapons and harvest techniques (AEWC 2018) summarizes the history of participation by the AEWC in IWC workshops on Whale Killing

Methods and Associated Welfare Issues in 2003, and again in 2006. The report describes AEWC efforts in the following areas:

(1) Introduction of a penthrite explosive projectile into the bowhead whale subsistence hunt;
(2) Ongoing hunter training in the use of the new equipment;
(3) Ongoing hunter training in shot-placement and accuracy; and
(4) Ongoing upgrades to traditional hunting equipment to improve the performance of the penthrite projectile and to enhance hunter safety, animal welfare, and hunting efficiency.

The size of landed whales differs among villages. Gambell and Savoonga (two villages on St. Lawrence Island) and Wainwright typically harvest larger whales than Point Hope and Utqiaġvik (Barrow). These differences were likely due to hunter selectivity, whale availability and season. For example, during spring in Barrow, smaller whales were caught earlier in the season than larger whales while the opposite was true in the autumn (Suydam and George, 2018). Villages along the western coast of Alaska harvest bowhead whales primarily during the spring migration, while villages along the Beaufort Sea hunt during the autumn migration. In recent years, the villages on St. Lawrence Island have been able to hunt bowhead whales when they overwinter in the Bering Sea. Overall, the sex ratio of the harvest has been equal (Suydam and George, 2018).

3.6 Co-management of Subsistence Whaling with AEWC

The purposes of the NOAA-AEWC Cooperative Agreement are to protect the Western Arctic population of bowhead whales and the Eskimo culture, to promote scientific investigation of the bowhead whale, and to effectuate the other purposes of the WCA, the MMPA, and the ESA, as those Acts relate to the aboriginal subsistence hunts for whales. Cooperative Agreements have been in place between NOAA and the AEWC since the first agreement was signed in March 1981, and have been renewed regularly thereafter[28]. The Cooperative Agreement was most recently updated and signed in December 2017.

3.6.1 Description of Management

The NOAA-AEWC Cooperative Agreement establishes a structure of relationships between the authorities and activities of NOAA and the AEWC. The Cooperative Agreement generally represents a functional delegation of on-the-ground management from NOAA to the AEWC, subject to NOAA oversight. The provisions of the Cooperative Agreement build on the

[28] NOAA and AEWC are signatories to the Cooperative Agreement, but NMFS has been delegated the responsibility for implementation on behalf of NOAA.

provisions of the AEWC Management Plan (adopted in November 1977, renewed on March 4, 1981, and continuously since) (Appendix 8.4). The authority and responsibilities of the AEWC are contained in and limited by the Cooperative Agreement and Management Plan, as amended, to the extent that the Management Plan is not inconsistent with the Cooperative Agreement. If AEWC fails to carry out its responsibilities, NOAA may assert its federal management and enforcement authority to regulate the hunt after notifying the AEWC of its intent, and providing an opportunity to the AEWC to discuss the proposed action. Subsection 100.1 of the AEWC Management Plan provides that the AEWC is empowered to administer the following regulations:

(1) Ensure an efficient subsistence harvest of bowhead whales;

(2) Provide a means within the Alaska Eskimo customs and institution to protect bowhead whale habitat and limit harvest to prevent extinction of the species; and

(3) Provide for Eskimo regulation of all whaling activities by Eskimo members of the AEWC.

As described in Subsection 100.11(b), the AEWC may deny any person who violates these regulations the right to participate in the hunt, make civil assessments, and act as an enforcement agent. In addition to administering and enforcing regulations within the Management Plan, the AEWC also provides village education programs including training programs for whaling captains and crews, participates in scientific research on bowhead whales, and initiates research to improve the accuracy and reliability of weapons used to hunt bowhead whales.

3.6.2 Quota Distribution among Villages

Under the AEWC Management Plan Subsection 100.26, the AEWC consults with each whaling village before establishing the level of harvest for each of those whaling villages during each season and adjustments may be made during the season, if a village does not use its allocation. As described in the AEWC Management Plan Subsection 100.22, each whaling captain registers with the AEWC on forms that disclose name, address, and age, qualifications as a captain, and willingness to abide by and require the crew to abide by AEWC regulations.

3.6.3 Monitoring and Enforcement of Hunting Regulations

Reports of each hunt must include the date, place, time of strike, size, and sex of the bowhead whale, reasons if struck and lost, and condition of struck and lost whales (subsection 100.23). Whaling crews must use traditional harvesting methods (as defined under subsection 100.24). Meat and edible products must be used exclusively for consumption and not be sold or offered for sale. Repercussions for violators can be severe; after an opportunity for a hearing before the AEWC, violators are prohibited from hunting or attempting to hunt for a period of not less than one whaling season nor more than five whaling seasons and/or may be subject to a civil fine not to exceed $10,000. Should a dispute between NOAA and AEWC occur over any of these matters, and resolution does not occur after consulting with AEWC, the dispute will be referred to an administrative law judge (15 CFR 904.200-904.272).

From the earliest years of the Management Plan, the AEWC has shown a remarkable resolve to intervene with whaling captains to enforce subsistence whaling catch limits and other provisions. Langdon (1984:51) refers to examples from 1981 and 1982, while Freeman (1989:151) describes a 1985 incident. More recent examples of AEWC action are available, including the imposition of serious fines for violations of the Management Plan and denial of harvest opportunities.

The AEWC considers the intentional taking of a whale calf or a cow with a calf to be a very serious infraction. However, unaccompanied calves can be mistaken for young adults, a situation occurring with some frequency given the current calving rate in the population. Several infractions involving the harvest of calves occurred between 2008 and 2012. While the harvesting of a calf does not have implications for the conservation of the stock, consistent with the IWC Schedule, the management plan forbids “the taking of a calf.” The taking of a whale calf or a cow accompanied by a calf is prohibited by Alaska Native hunting tradition (Suydam and George, 2006), by the AEWC Management Plan for the bowhead subsistence hunt, the WCA regulations, and by the IWC Schedule. The following describes infractions from 2008 to present, as well as the actions taken as a result of the infractions.

During the fall 2008 hunt, one landed whale was a male calf, 7.2 m in length (Whale ID 08KK1, September 6, 2008) (Suydam et al., 2009). The whale’s baleen length was 42 cm and milk was present in his stomach. The calf was seen swimming alone in the eastern Beaufort Sea near Kaktovik. Hunters mistakenly harvested the calf thinking it was a small, independent subadult whale (IWC, 2009b). The AEWC Board of Commissioners met on March 2, 2009 to take testimony from the crew in question and crews nearby. After receiving testimony, the Commissioners determined that the crew had taken all possible precautions, but that the absence of a large whale in the area where the calf was taken led to an honest mistake

During the fall 2009 hunt, hunters mistakenly harvested two female bowhead calves thinking they were small, independent whales (IWC, 2010b). One animal (Whale ID 09KK3) landed at Kaktovik was 6.6 m in length with 38 cm long baleen, the other (09N2) landed at Nuiqsut was 6.2 m in length but baleen length was not measured (Suydam et al., 2010). There was no milk present in the stomach of either whale. Both calves were seen swimming alone in the Beaufort Sea. A whale landed in Utqiaġvik (Barrow) (09B11) was also short (7.2 m) but its baleen was 72 c m long, suggesting it was not a calf (Suydam et al., 2010).

In 2011, according to IWC Infractions reporting documents, one bowhead calf was inadvertently taken by a crew from the village of Kaktovik during the fall bowhead whale subsistence hunt. During a hearing by the AEWC Board of Commissioners, it was found that crew in the area observed a whale that appeared to be unaccompanied. After the whale was struck, another whale surfaced in the same area. After landing, it was determined that the struck whale was a calf. Therefore, it is assumed that the other whale which surfaced after the strike was a cow or another adult accompanying the calf. The AEWC Board of Commissioners found that the strike of the calf was unintentional and an accident resulting from the fact that the calf appeared to be unaccompanied prior to the strike. No sanction was imposed.

In 2013, according to IWC Infractions reporting documents, on two occasions during the fall hunt a bowhead whale swimming independently was taken in Utqiaġvik (Barrow), and upon landing was determined to be a calf, based on body length, baleen length, and stomach contents.

In 2016, during the spring hunt a very experienced crew inadvertently struck a bowhead calf, having incorrectly identified it as a larger whale. The AEWC staff and Board of Commissioners conducted an investigation of the incident and held a hearing to take testimony from the captain and crew. Under the circumstances, including recognition of the fact that this experienced captain had never before committed an infraction, it was determined that a warning would be issued, but no penalty would be imposed.

3.6.4 Reporting Requirements

It is the responsibility of the whaling captains and crew to report to the Commissioner of their village on a daily basis when they are whaling. The Commissioner of that village then reports to the AEWC’s central office in Utqiaġvik (Barrow), AK. The AEWC office develops a report, which is then passed on to the NMFS office in Anchorage for compilation. According to the NOAA-AEWC Cooperative Agreement, on the first of each month during the whaling seasons, the AEWC must inform NOAA of the number of bowhead whales struck during the previous month. The final harvest report is due to NOAA within 30 days after the conclusion of the whaling season.

After completion of each whaling season (fall and spring), the AEWC submits a comprehensive harvest report to the NMFS offices in Anchorage, as well as the Office of International Affairs and Seafood Inspection. These harvest reports fulfill U.S. obligations to the IWC with respect to recording harvest information, including infractions.

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4.0 ENVIRONMENTAL CONSEQUENCES

4.1 Methodology

This Section describes the predicted direct, indirect, and cumulative effects on the biological and human environment from implementing the alternatives described in **Section 2**.

4.1.1 Definition of Terms

The following terms are used throughout this document to discuss impacts:

Direct Effects – effects caused by the action and occurring at the same time and place (40 CFR 1508.8). Direct effects pertain to the proposed action and alternatives only.

Indirect Effects – effects caused by an action and later in time or farther removed in distance but still reasonably likely. Indirect effects may include growth inducing effects and other effects related to induced changes in the pattern of land use, population density, or growth rate, and related effects on air and water and other natural systems, including ecosystems (40 CFR 1508.8). Indirect effects are caused by the project, but do not occur at the same time or place as the direct effects. Indirect effects pertain to the proposed action and alternatives only.

Cumulative Effects – additive or interactive effects that would result from the incremental impact of the proposed action when added to other past, present, and reasonably foreseeable future actions (RFFAs) regardless of what agency (federal or non-federal) or person undertakes such other actions (40 CFR 1508.7). Interactive impacts may be either countervailing (where the net cumulative effect is less than the sum of the individual effects) or synergistic (where the net cumulative effect is greater than the sum of the individual effects). EISs address reasonably foreseeable cumulative effects issues, rather than speculative impact relationships. **Section 4.1.3** describes steps involved in the cumulative effects assessment.

Reasonably Foreseeable Future Actions – used in concert with the CEQ definitions of cumulative effects, but the term itself is not further defined. Most regulations that refer to reasonably foreseeable do not define the meaning of the words, but do provide guidance on the term. For this analysis, RFFAs or impacts are those that are likely (or reasonably certain) to occur within the timeframe used for analyzing environmental consequences, and are not purely speculative. The determination of reasonably foreseeable is based on documents such as existing plans, permit applications, or announcements.

4.1.2 Steps for Determining Level of Impact

The National Environmental Policy Act (NEPA) requires federal agencies to prepare an EIS for any action that may significantly affect the quality of the human environment. The CEQ regulations implementing NEPA state that an EIS should discuss the significance, or level of impact, of the direct, indirect, and cumulative effects of the proposed alternatives (40 CFR 1502.16), and that significance is determined by considering both the context in which the action will occur and the intensity of the action (40 CFR 1508.27). Context and intensity are often further broken down into components for impact evaluation. The context is composed of the extent of the effect (geographic extent or extent within a species, ecosystem, or region) and any special conditions, such as endangered species status or other legal status. The intensity of an impact is the result of its magnitude and duration. Actions may have both adverse and beneficial effects on a particular resource. A component of both the context and the intensity of an effect is the likelihood of its occurrence.

The combination of context and intensity is used to determine the level of impact on each type of resource. The first step is to examine the mechanisms by which the proposed action could affect the particular resource. For each type of effect, the analysts develop a set of criteria to distinguish between major, moderate, minor, or negligible impacts. The analysts then use these impact criteria to rank the expected magnitude, extent, duration, and likelihood of each type of effect under each alternative.

Tables 4.1-1 through 4.1-3 provide a guideline for the analysts to place the effects of the alternatives in an appropriate context and to draw conclusions about the level of impact. The criteria used to assess the effects of the alternatives vary for the different types of resources analyzed. The impact criteria tables employ terms and thresholds that are quantitative for some components and qualitative for others. The terms used in the qualitative thresholds are somewhat imprecise and relative, necessarily requiring the analyst to make a judgment about where a particular effect falls in the continuum from "negligible" to "major." The following descriptions of the terms used in the criteria tables are intended to help the reader understand the distinctions made in the analyses.

The magnitude or intensity of effects on biological resources is generally assessed in terms relative to the population rather than the individual. The Marine Mammal Protection Act (MMPA), as amended, established a management objective to reduce incidental mortality of marine mammals in commercial fisheries. To this end, it defines an upper limit guideline for fishery-related mortality for each species or management stock, defined as the Potential Biological Removal (PBR). Potential Biological Removal (PBR) is defined by the MMPA as the maximum number of animals, not including natural mortalities, which may be removed from a marine mammal stock while allowing that stock to reach or maintain its optimum sustainable population. It is the product of the minimum population estimate of the stock; one-half the maximum theoretical or estimated net productivity rate of the stock at a small population size;

and a recovery factor of between 0.1 and 1.0. The PBR for bowhead whales of the Western Arctic stock is 161 individuals annually (NMFS, 2016).

PBR was developed as a measure of the impact of total human-caused mortality, with management implications under the MMPA for commercial fisheries bycatch. Whereas, the subsistence harvest of Western Arctic bowhead whales is managed under the authority of the Whaling Convention Act. Accordingly, the aboriginal subsistence whaling provisions in the International Whaling Commission (IWC) Schedule take precedence over the PBR estimate for the purpose of managing the Alaska Native subsistence harvest from this stock.

However, it is important in the EIS process to evaluate the impacts of different levels of subsistence harvest, and PBR can be used as a metric for that purpose in the absence of the IWC's Bowhead Strike Limit Algorithm (SLA). The 2016 PBR of 161 animals was calculated using a Recovery Factor (Fr) of 0.5. The results of Wade (1998) can be used to evaluate the impact of different levels of take calculated with different Fr levels for bowhead whales, assuming unbiased estimates of abundance, human-caused mortality, and R_{max}, which is reasonable in this case. Noting that PBR is not the metric used by the IWC to evaluate the effects of subsistence whaling, in the absence of an evaluation under the Bowhead SLA, an annual take of fewer than 32 bowheads (Fr=0.1) would have a negligible impact using PBR, i.e., would cause a slight change in a pristine population that would not be measurable, and would not cause a measurable change in the rate of recovery of a depleted population. An annual take of between 32 and161 bowheads (Fr = 0.5) would have a minor impact, i.e., could cause a minor change in a pristine population while allowing a depleted population to recover rapidly. An annual take of between 161 and 322 bowhead whales could cause a moderate change in a pristine population, but the population would stay at its optimum sustainable population, and would allow a depleted population to recover to its optimum sustainable population. An annual take of more than 322 bowhead whales would have a major impact, i.e., would cause a major population change and would lead to depletion of the population (Wade, Pers. comm., 2018). PBR will be used to help assess Alternative 5, given that the harvest levels in Alternative 5 have not yet been evaluated using the Bowhead SLA.

The IWC determines safe strike limits for bowhead whales using its Bowhead Strike Limit Algorithm (SLA). This SLA does not provide an upper limit for safe catch. Instead, it evaluates a requested level of catch and determines whether that would maintain the IWC stock conservation and recovery goals (see **Section 3.2.1**). Since adoption in 2003, the Bowhead SLA has always confirmed that the requested level of 67 strikes per year (plus carryover) is safe.

Prior to the IWC's use of the Bowhead SLA, one approach to setting the harvest limit was to use the values of the catch control rule Q. (See **Section 3.2.1** for the introductory discussion of the catch control rule Q.) Q from the 2006 stock assessment ranged from a low bound of 155 whales per year, termed Q_{low}, to a high bound of 412, termed Q_{high},with a best estimate value of 257, termed Q_{best} (Brandon and Wade, 2006). A take that was below Q_{low} (155 whales per year) was considered a minor impact. A take that was between Q_{low} (155 whales) and up to Q_{high} (412 whales) was considered a moderate impact. A take greater that Q_{high} (412 whales) was considered a major impact. The Western Arctic bowhead whale abundance estimates have increased since the 2006 stock assessment (see **Figure 3.2.1-1**), and so, there is no reason to think that a current estimate of Q_{low} would be any lower today if a revised assessment were conducted. These impact criteria will be used to help assess Alternative 5, given that the harvest levels in Alternative 5 have not yet been evaluated using the Bowhead SLA.

For wildlife species other than bowhead whales, the magnitude of the effects of the alternatives is based on potential mechanisms for effects on mortality and disturbance and the relationship of bowhead whaling activities with the species considered. The impact criteria for wildlife are summarized in **Table 4.1-2.**

The analysis of sociocultural impacts examines effects of the alternatives on subsistence use patterns, whaling community health and nutrition, and public safety. For impacts to subsistence users, the magnitude and intensity of effects are based on the potential for loss or substantial reduction in production of key subsistence resources. For impacts to health and nutrition, and to public safety, the magnitude of effects is based on the proportion of the communities and population affected.

The geographic extent component is intended to estimate the distribution of effects relative to a population or non-biological resource as a whole. For bowhead whales and other wildlife, local populations are defined as those populations that are generally distributed near a particular whaling community in some portion of their ecological range.

The geographic extent of sociocultural impacts is first defined in relation to the bowhead subsistence whaling communities and their traditional subsistence use areas. In addition, because these communities share bowhead subsistence foods widely, sociocultural effects could indirectly extend to those distant receiving communities, including those in neighboring regions, and also the Iñupiat and Siberian Yupik families living in Fairbanks and Anchorage who remain integrated in sharing networks. The impact criteria for sociocultural resources are summarized in **Table 4.1-3.**

The duration or frequency component provides the context of time. “Short-term” refers to a temporary effect that lasts from a few minutes to a few days, after which the affected animals or resources revert to a "normal" condition. “Moderate” duration refers to an intermediate period of one migration season to several years. "Long-term" describes more permanent effects that may last for years or from which the affected animals or resources never revert to a "normal" condition. Frequency can range from “infrequent” effects that occur twice a year or less, to “intermittent” effects that occur on the order of monthly during a year. "Frequent" refers to effects that occur on a regular or repeated basis each year. Other elements of the temporal context of effects, such as whether the effects occur primarily during a sensitive or critical part of the year, are described in the analyses for each species or resource.

This assessment also evaluates the likelihood of an effect, in other words whether the potential effects are plausible or speculative. "Likely" effects are those that could arise from reasonable or demonstrated mechanisms, and the probability of those mechanisms arising from an alternative is greater than 50 percent. This does not imply that the analysts perform a formal probability calculation. Instead analysts use professional judgment to make a qualitative determination that the probability of the effect occurring is more likely than not. The likelihood of occurrence is considered in assessing magnitude, extent, and duration, as these factors are defined above. The determination of level of impact for each of these three factors is made on the basis of effects that are more likely to occur than not.

4.1.2.1 Determining the Quota

Since the late 1970s, the IWC has adopted catch limits for Western Arctic bowhead whale harvests, after considering the nutritional and cultural need for bowhead whales by Alaska Natives and the level of harvest that is sustainable. Beginning in 1997, the IWC also has factored Russian Native needs and level of harvest into its consideration of bowhead whale catch limits. In 1986, the IWC accepted a method to calculate subsistence and cultural need of Alaska Natives for bowhead whales. This method incorporates the historic and current size of the Alaska Native population residing in Alaskan subsistence hunting villages and the number of bowhead whales historically landed by each community (**Appendix 8.1**).

The IWC first established five-year block catch limits for this stock in 1997, allowing a total of 280 bowhead whales to be landed in each five-year period, or an average of 56 landed whales per year, and no more than 67 whales struck each year with a carryover of 15 unused strikes. Starting in 2013, the catch limit regime has continued as six-year blocks over which no more than 336 bowhead whales may landed. The five- and six-year block catch limits continued the established practice of limiting strikes to 67 per year and providing for the carry-forward of up to 15 unused strikes, in order to allow for the fact that variable hunting conditions mean that not every struck whale is landed.

In 2018, and as indicated in **Sections 1.2.2 and 2.0**, the IWC adopted a bowhead catch limit for 2019 through 2025 with the same annual strike limit of 67 whales as the previous quota block, and a seven-year block limit of 392 landed whales. As indicated in **Section 2.0**, the total number of bowhead whales that can be landed over any six-year period will remain unchanged at 336. In addition the IWC changed the carry-forward provision. Schedule paragraph 13(b)(1) provides, in part, that "any unused portion of a strike quota from the three prior quota blocks shall be carried forward and added to the strike quotas of subsequent years, provided that no more than 50 percent of the annual strike limit shall be added to the strike quota for any one year." The IWC also adopted an automatic renewal provision for sustainable status quo catch limits.

Since 2002, suitability of the bowhead whale strike limits has been determined using the Bowhead Strike Limit Algorithm (SLA) program (IWC, 2003a). Inputs of the SLA include bowhead whale catches, abundance estimates from 1978 to the present time, and the value of need (i.e., number of whales permitted to be struck each year multiplied by the number of years of the quota). The Bowhead SLA does not provide an upper limit for safe catch. Instead, it evaluates a requested level of catch and determines whether that would maintain the IWC stock conservation and recovery goals (see **Section 3.2.1**). In 2004, the results of the Bowhead SLA calculations showed "that this level of need can be satisfied while fully meeting the Commission's management objectives" (IWC, 2005a:23).

The IWC Schedule authorizes the aboriginal harvest of Western Arctic bowhead whales. Annual strike quotas and landed limits for aboriginal subsistence hunting of bowhead whales are determined each year after consultation with the Alaska Eskimo Whaling Commission (AEWC) and renewal of the U.S.-Russia bilateral agreement governing the allocation of the bowhead whale subsistence catch limit between the two countries. The U.S. and the Russian Federation have agreed through 2018 on a sub-allocation of seven strikes of bowheads per year to the Chukotkan aboriginal whalers (**Appendix 8.3**).

4.1.2.2 Impact Criteria

Table 4.1-1 provides a framework within which effects on bowhead whales can be assessed. This table summarizes the criteria for determining the level of impact based on the type (mortality or disturbance), the components (magnitude, extent, and duration) and the thresholds for four levels of effects (negligible, minor, moderate, and major). As noted in **Section 4.1.2**, the components of impact (magnitude, extent, and duration) are established in CEQ regulations. This framework represents the best judgment of the analysts in identifying mortality and disturbance as the key types of effects, and in establishing thresholds for a range of impact levels from negligible to major. The results of applying this framework are found in **Sections 4.4 and 4.5**, which describe the anticipated direct and indirect effects for each alternative on bowhead whales. Since the provisions for carry- forward of strikes represent the key difference among the alternatives, the analysis focuses on evaluating the scope and intensity of effects from each level of the strike limit carry-forward.

Table 4.1-1.
Criteria for Determining Impact Level for Effects on Bowhead Whales

Type of Effect	Impact Component	Impact Level			
		Negligible	Minor	Moderate	Major
Mortality	Magnitude or Intensity	Mortality effects but no measurable change in population	Causes minor population change	Causes moderate population change	Causes major population change
	Geographic Extent	No measurable population decline	Population decline measurable at one location	Population decline measurable at several locations	Population decline measurable across range of stock
	Duration or Frequency	No measurable population decline	Short-term or infrequent population decline	Moderate-term or intermittent population decline	Long-term and/or repeated population decline
Disturbance	Magnitude or Intensity	No measurable effects	Disturbance effects occur but distribution remains similar to baseline	Noticeable change in localized distribution	Enough to cause shift in regional distribution
	Geographic Extent	No measurable effects	Effects limited to one location	Effects distributed among several locations	Effects distributed across range of stock
	Duration or Frequency	No measurable effects	Periodic, temporary, or short-term	Moderately frequent or intermittent	Chronic and long- term

Table 4.1-2 provides a framework for assessing the effects of bowhead whale harvests and whaling-related activities on other biological resources (other than bowhead whales). These effects are primarily related to disturbance associated with whaling activities, or redirection of subsistence harvests to other species if bowhead whaling were prohibited. Some habitat damage can also occur from other actions and events. This table summarizes the criteria, developed by the project scientists, for determining the level of impact based on the magnitude, extent, and duration. **Section 4.7, Section 4.8, and Section 4.9** summarize the anticipated direct, indirect, and cumulative effects under each alternative for other biological resources.

Table 4.1-2.
Criteria for Determining Impact Level for Effects on Other Wildlife

Type of Effect	Impact Component	Impact Level			
		Negligible	Minor	Moderate	Major
Mortality	Magnitude or Intensity	Mortality effects but no measurable change in population	Causes minor population change	Causes moderate population change	Causes major population change
	Geographic Extent	No measurable effects	Effects limited to one location	Effects distributed among several locations	Effects distributed across range of population
	Duration or Frequency	No measurable effects	Short-term or moderate and intermittent or infrequent	Moderate and frequent or long- term and intermittent	Long-term and/or frequent
Disturbance	Magnitude or Intensity	No measurable effects	Disturbance effects occur but distribution similar to baseline	Noticeable change in localized distribution	Enough to cause shift in regional distribution
	Geographic Extent	No measurable effects	Effects limited to one location	Effects distributed among several locations	Effects distributed across range of stock
	Duration or	No measurable	Periodic, temporary, or	Moderately frequent or	Chronic and

	Frequency	effects	short-term	intermittent	long- term

Table 4.1-3 provides a framework for assessing the effects of bowhead whale harvests and whaling-related activities on the social and cultural environment, and the criteria, developed by the project scientists, for determining the level of impact based on the magnitude, extent, and duration. These effects are primarily related to subsistence characteristics and public health and safety. **Section 4.8** summarizes the anticipated direct, indirect, and cumulative effects under each alternative for these resources.

Table 4.1-3.
Criteria for Determining Impact Level for Effects on Socio-cultural Resources.

Type of Effect	Impact Component	Impact Level			
		Negligible	**Minor**	**Moderate**	**Major**
Effects on subsistence	**Magnitude or Intensity**	No decline in production of major subsistence resources	Minor decline in production affecting few resources or limited seasons	Moderate decline in production affecting several resources or seasons	Substantial decline in production of major subsistence resources
	Geographic Extent	No measurable effects	Effects realized at few locations	Effects realized in numerous locations	Effects realized throughout the project area
	Duration or Frequency	No measurable effects	Periodic, temporary, or short-term	Moderate and frequent or long- term and intermittent	Chronic and long- term
Effects on public health and safety	**Magnitude or Intensity**	No measurable effects	The health and safety of < 5% of the population in the community would be affected	The health and safety of 5%-25% of the population in the community would be affected	The health and safety of >25% of the population in the community would be affected
	Geographic Extent	No measurable effects	Affects individuals in few communities	Affects individuals in half of the communities	Affects individuals throughout project area

	Duration or Frequency	No measurable effects	Periodic, temporary, or short-term	Moderately frequent or intermittent	Long-term and/or frequent

4.1.3 Steps for Identifying Cumulative Effects

To meet the requirements of NEPA, an EIS must include an analysis of the cumulative effects of a proposed action and its alternatives and consider those cumulative effects when determining environmental impacts. The CEQ guidelines for evaluating cumulative effects state that "...the most devastating environmental effects may result not from the direct effects of a particular action but from the combination of individually minor effects of multiple actions over time" (CEQ, 1997). The CEQ regulations for implementing NEPA define cumulative effects as follows:

The impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative effects can result from individually minor but collectively significant actions taking place over a period of time (40 CFR 1508.7).

For this FEIS, assessment of cumulative effects requires an analysis of the direct and indirect effects of the proposed subsistence whaling catch limit alternatives, in combination with other past, present, or RFFAs potentially affecting bowhead whales, other biological resources, and subsistence harvest practices, and other socioeconomic resources. The intent of this analysis is to capture the total effects of many actions over time that would be missed by evaluating each action individually, and to assess the relative contribution of the proposed action and its alternatives to cumulative effects. The cumulative effects assessment then describes the additive and synergistic result of the subsistence whaling catch limit alternatives as they are reasonably likely to interact with actions external to the proposed actions. The ultimate goal of identifying cumulative effects is to provide for informed decisions that consider the total effects (direct, indirect, and cumulative) of the subsistence whaling catch limit alternatives.

The methodology used for cumulative effects analysis in this FEIS is drawn from the 2013 FEIS on the Alaska Eskimo Subsistence Hunt on Bowhead Whales and the 2008 FEIS on the Alaska Eskimo Subsistence Hunt on Bowhead Whales. This methodology includes the following steps:

- Identify issues, characteristics, and trends within the affected environment that are relevant to assessing cumulative effects of the alternatives. This information is summarized in **Section 3, "Affected Environment."**

- Describe the direct and indirect effects of the subsistence whaling catch limit alternatives. This information is presented here in **Section 4, "Environmental Consequences."**

- Define the spatial (geographic) and temporal (time) frame for the analysis. For the purposes of this FEIS, the reasonably foreseeable future has been established as the next 10 years or through 2028.

- Identify past, present, and reasonably foreseeable external actions such as other types of human activities and natural phenomena that could have additive or synergistic effects. The cumulative effects analysis uses the specific direct and indirect effects of each alternative and combines them with these identified past, present, and reasonably foreseeable effects of the identified external actions.

- Use cumulative effects tables to screen all of the direct and indirect effects, when combined with the effects of external actions, to capture those synergistic and incremental effects that are potentially cumulative in nature. Both adverse and beneficial effects of external factors are assessed and then evaluated in combination with the direct and indirect effects to determine if there are cumulative effects.

- Evaluate the impact of the reasonably likely cumulative effects using the criteria established for direct and indirect effects, and assess the relative contribution of the action alternatives to cumulative effects.

- Discuss rationale for determining the impact rating, citing evidence from the peer-reviewed literature, and quantitative information where available. The term 'unknown' can be used when there is not enough information to determine an impact level.

The advantages of this approach are that it closely follows 1997 CEQ guidance, employs an orderly and explicit procedure, and provides the reader with the information necessary to make an informed and independent judgment concerning the validity of the conclusions.

4.1.3.1 Relevant Past and Present Actions within the Project Area

Relevant past and present actions are those that have influenced the current condition of the resource. For the purposes of this FEIS, past and present actions include both human-controlled events, such as subsistence harvest, oil and gas exploration and development activities, and commercial fisheries, and natural events, such as predation and climate dynamics, some of which are influenced by human activity.

Extensive information about the effects of oil and gas activities on bowhead whales is discussed in several documents. The past actions applicable to the cumulative effects analysis have been either presented in **Section 3** of this document or previously reviewed in biological opinions prepared by NMFS for the following projects:

- SAExploration, Inc. (SAE) 3D OBN Open-Water Seismic exploration in the Beaufort Sea, AK (NMFS 2015a);
- Hilcorp Shallow Geohazard and Strudel Scour Surveys in Foggy Island Bay, Beaufort Sea, AK (NMFS 2015b);
- Shell Exploration Drilling Program in the Chukchi Sea, AK (NMFS 2015c);
- Lease Sale 193 Oil and Gas Exploration Activities, Chukchi Sea, Alaska (NMFS 2015d);
- SAExploration, Inc. (SAE) 3D OBN Open-Water Seismic in Colville River Delta, AK (NMFS 2014a);
- BP Exploration (BPXA) Shallow Geohazard Survey Foggy Island Bay, Beaufort Sea, AK (NMFS 2014b);
- BP Exploration (BPXA) 3D OBS Open-Water Seismic Survey Prudhoe Bay, Beaufort Sea, AK (NMFS 2014c).

The cumulative effects analysis relies on the descriptions presented in those documents. Additional past actions were identified using agency documentation, NEPA documentation, reports and resource studies, peer-reviewed literature, and best professional judgment. **Table 4.1-4** lists relevant past and present actions, and notes where descriptions of those actions can be located in this document.

4.1.3.2 Reasonably Foreseeable Future Actions (RFFAs) within the Project Area

RFFAs are those that:

- Have already been or are in the process of being funded, permitted, described in fishery management plans, oil and gas lease sale documents, or coastal zone management plans;
- Are included as priorities in government planning documents; or
- Are likely to occur or continue based on traditional or past patterns of activity.

Judgments concerning the probability of future impacts must be informed rather than based on speculation. RFFAs to be considered must also fall into the temporal and geographic scope described in **Section 4.1.3.3**.

Reasonably foreseeable future human-controlled and natural actions were screened for their relevance to the alternatives proposed in this FEIS. Due to the large geographic scope dealt with in this analysis, the identification of RFFAs was conducted on a broad scale, though specific RFFAs were considered where applicable. The following list presents the actions to be considered in the cumulative effects analysis, and **Table 4.1-4** compares those actions with past and present actions:

- **Subsistence activities**: Subsistence harvests of bowhead whales by Alaska Natives who dwell on the North Pacific Ocean or Arctic Ocean coasts of Alaska are likely to continue at present levels as described in **Section 3**. Subsistence harvests of other animals are assumed to continue at present levels.

- **Oil and gas activities**: Oil and gas leases in the Beaufort and Chukchi seas will result in continued and future offshore production facilities and pipelines, drilling activities, seismic programs, transportation and barging, staging, fixed and temporary camp operations, and ice road construction. Additional impacts from oil pollution and VLOS can occur from road runoff, bilge cleaning and ship maintenance, natural seeps, pipeline and platform spills, oil tanker spills, and offshore drilling. Other marine pollution and debris can occur due to industrial activities, waste disposal, and atmospheric deposition. Marine species may accumulate contaminants such as PCBs and polycyclic aromatic hydrocarbons (PAHs).

- **Climate variability**: Short-term changes in the ocean climate are likely to continue on a scale similar to those presently occurring. The preponderance of evidence indicates that human activities are causing some degree of global climate change due to anthropogenic warming of the atmosphere and oceans. This warming leads to shifts in global and regional weather patterns, among other effects.

- **Commercial shipping and other vessel traffic**: Trans-Arctic commercial shipping will likely increase as northern sea routes and Alaskan ports become increasingly ice-free for longer periods throughout the year, as onshore and offshore areas are developed for oil and gas, and as local communities grow.

- **Commercial fisheries**: Federal and state fisheries in the U.S. operate according to the Fishery Management Plans (FMPs). State- and Federally-regulated fisheries in the project area are administered by the North Pacific Fishery Management Council (NPFMC) and the Alaska Board of Fisheries (ABF). The NPFMC oversees management of Halibut and groundfish in the U.S. Exclusive Economic Zone (EEZ) off Alaska and ABF manages fisheries in nearshore waters as well as offshore crab fisheries.

- **Research activities**: Activities related to the scientific research of the physical and biological environment are likely to continue, including research of bowhead whales, other marine mammals, fish, birds, and marine predator-prey relationships.

- **Other development**: Coastal development within the project area, including port expansions and the construction of docks and facilities within the project area, is likely to occur as needs for marine support services and shipping capacity increase.

- **Mortality**: Disease, parasites, and predation will continue to result in mortality of marine mammals, fish, and birds. Factors such as exposure to contaminants, decreased genetic diversity, and increased stress can lead to reduced fitness, which in turn can increase susceptibility to mortality from disease and predation, as described in **Section 3**.

Table 4.1-4
Past, Present, and RFFAs Considered in the Impact Analyses

Activity	Past and Present	Reference (within this FEIS)	Reasonably Foreseeable
Human-Caused Activities			
Subsistence activities	Harvest of marine and terrestrial mammals, fish, and birds	3.2.3 3.3	Harvest of marine and terrestrial mammals, fish, and birds
Commercial harvest	Commercial whaling	3.2.2	None
Oil and gas activities, including industrial pollutants and VLOS	Seismic exploration Offshore drilling and production Industrial noise Marine spills and pollution Marine debris Contaminant bioaccumulation Human health effects	3.2.8 4.6.1 4.6.1.3 (Oil spills) 4.6.3	Seismic exploration Offshore exploration and development Construction and maintenance of oil and gas facilities Associated transportation activities (barging, pipelines, aircraft and vessel traffic) Marine spills and pollution Marine debris Contaminant bioaccumulation Human health effects Industrial noise
Commercial fisheries	Crab and pot-based fisheries (entanglement in gear) Ship strikes	3.2.6 4.6.4	Crab and pot-based fisheries (entanglement in gear) Ship strikes

Commercial shipping	Barge/vessel traffic and fuel spills Ship strikes Aircraft traffic	3.2.7 4.6.1.3 (Oil spills) 4.6.3	Barge/vessel traffic and fuel spills Ship strikes Aircraft traffic
Other developmen t	Military activities Coastal and infrastructure development Tourism	4.6.6	Military activities Coastal and infrastructure development Tourism
Research Activities	Biological Oceanographic Geophysical/chemical (see oil and gas development)	4.6.5	Biological Oceanographic Geophysical/chemical (see oil and gas development)
Natural Systems			
Climate variability	Global warming	4.6.2	Global warming
Mortality	Predation Disease and parasites	3.2.4 3.2.5	Predation Disease and parasites

Table 4.1-5 provides a list of the RFFAs likely to occur in the project area, and identifies which resources a particular RFFA could affect.

Table 4.1-5
RFFAs Considered in the Cumulative Impact Analyses

RFFA	Anticipated Cumulative Impacts to Resource
Subsistence Activities	1, 2, 3, 4, 5, 6
Commercial Harvest	1, 2, 3, 6
Oil and Gas Activities	1, 2, 3, 4, 5, 6
Global and Industrial Pollutants	1, 2, 3, 4, 5, 6
Commercial Fisheries	1, 2, 5, 6
Commercial Shipping	1, 2, 5, 6
Other Development	1, 2, 5, 6
Scientific Research	1, 2
Climate Variability	1, 2, 3, 4, 5, 6
Mortality	1, 2, 3
KEY	
1. Bowhead Whale (stock) 2. Other Wildlife 3. Alaska Eskimo Health	4. Alaska Eskimo Safety 5. Other Tribes and Aboriginals 6. General Public

4.1.3.3 Project Area and Scope for Analysis

The spatial scope of the effects analysis is the entire geographic range of the Western Arctic bowhead whale stock in the Bering, Chukchi, and Beaufort seas, including Russian Federation and Canadian waters in this range. When this spatial scope is not applicable to a given resource, a relevant geographic sub-area is defined in the analysis.

Evaluation of cumulative effects requires an analysis of the potential direct and indirect effects of the proposed alternatives, in combination with other past and present actions and RFFAs. The timeframe or temporal scope for the past and present effects analysis was defined as the period since the Western Arctic bowhead whale stock was first commercially hunted in the Bering Sea in 1848. For each resource, the timeframe for past and present effects is described in Section 3.

RFFAs considered in the cumulative effects analysis consist of projects, actions, or developments that can be projected, with a reasonable degree of confidence, to occur in the foreseeable future and that are likely to affect the resources described. A common practice is to project five to 10 years forward, and in this case, the 10-year timeframe was chosen because reasonable estimates of future actions that may affect the Chukchi and Beaufort seas are available for this period.

4.2 Incomplete and Unavailable Information

The CEQ guidelines require that when an agency is evaluating reasonably foreseeable significant adverse effects on the human environment in an environmental impact statement and there is incomplete or unavailable information, the agency shall always make clear that such information is lacking (40 CFR 1502.22). In the event that there is relevant information, but the overall costs of obtaining it are exorbitant or the means to obtain it are not known (40 CFR 1502.22), the regulations instruct that the following should be included:

- A statement that such information is unavailable;
- A statement of the relevance of such information to evaluate reasonably foreseeable significant adverse impacts;
- A summary of existing information that is relevant to evaluating the adverse impacts; and
- The agency's evaluation of adverse impacts based on generally accepted scientific methods.

In the analysis, this FEIS identifies those areas where information is unavailable and whether existing information can support an adequate evaluation of the environmental consequences of the alternatives. The direct, indirect, and cumulative effects analyses are based on readily available information; however, those data gaps that still exist are identified, in accordance with the above CEQ guidelines.

4.3 Resources and Characteristics of the Project Area Not Carried Forward For Analysis

Species that would not be affected directly or indirectly by bowhead whaling activities include gray whales, minke whales, killer whales, harbor porpoise, short-tailed albatross, and many terrestrial mammals. These species were not considered for further analysis because the alternatives would not affect these species.

4.4 Direct and Indirect Effects of the Alternatives on the Western Arctic Bowhead Whale in the Project Area

Five alternatives were developed for consideration in this FEIS based, in part, on the IWC-adopted strike limit, which includes takes in both Alaska and the Russian Federation. Three of the proposed alternatives assess the merits of different options in the carry forward of strikes, without suggesting a change to the existing landed limits adopted by the IWC since 1997, and as established through several decades of scientific research and calculations. One alternative contemplates a quota reduction (to zero) while another contemplates a 50 percent increase in the quota.

In the analysis of impacts under the alternatives, the risk of mortality is estimated based on the strike quota rather than the total for landed whales. The fate of struck and lost whales, and the likelihood of their mortality, is not fully known. For the purposes of assessing biological impacts, it is necessary to take a precautionary approach and assume that all struck whales represent mortalities. This is a worst-case scenario required for the analysis and not an assertion that all strikes from subsistence whaling result in mortalities.

Alternative 1 (No Action)

Alternative 1 would have NMFS take no action to establish catch limits under the WCA for subsistence take of bowhead whales, notwithstanding the IWC Schedule's requirement to establish catch limits and permit aboriginal subsistence whaling for Western Arctic bowhead whales, subject to certain limitations.

For the purpose of analysis, no bowhead whales would be taken by Alaska Natives in subsistence harvests under Alternative 1. Therefore, the magnitude, extent, and duration/frequency of direct mortality under this alternative by an AEWC hunt are considered negligible to the population of bowheads (using the method outlined in **Table 4.1-1**). Since the IWC catch limits for Western Arctic bowhead whales are shared with natives from Chukotka in the Russian Federation, NMFS' implementation of a no action alternative would make more whales available for a bowhead hunt by Russian Natives. Human activities associated with subsistence whaling by Alaska Natives would be sharply reduced under this alternative, so that the amount of noise and disturbance from subsistence whaling would also be considered negligible. Since 1978, when the IWC began to regulate the subsistence harvest, the Western Arctic bowhead stock has been growing, with an estimated yearly growth rate of 3.2% between 1984 and 2003 (see **Section 3.2.1** and **Figure 3.2.1- 1**). Without subsistence harvests, the growth rate may increase to an estimated 3.7% per year (an increase of one half of one percent), assuming Russian Natives would not increase their bowhead harvest in the absence of a bowhead hunt by Alaska Natives.

It is important to note that because the WCA requires NMFS to implement requirements of the IWC Schedule, this alternative would be contrary both to the Schedule and to U.S. law.

Alternative 2

Alternative 2 would allow NMFS to grant the AEWC the U.S. portion[29] of an annual strike limit of 67 bowheads per year, not to exceed the U.S. portion of a total of 336 landed whales over any six-year period. No carry-forward of unused strikes would be allowed.

Over any six-year period the maximum annual mortality could be 67 whales, subject to a total of 336 landed whales over any six-year period. Given the current abundance and growth trends (**Section 3.2.1**), this total annual mortality is unlikely to cause the population to decline or notably slow its rate of recovery. The magnitude, geographic extent, and duration/frequency of this level of mortality are therefore considered negligible for the bowhead population (**Table 4.1-1**). Human activities associated with subsistence whaling under Alternative 2 would vary from year to year and place to place depending on whale movements, weather, ice characteristics, and social factors. Effects of human activities are localized and timed to coincide with the presence of whales during spring and autumn migrations. The disturbance to the Western Arctic bowhead whales from subsistence whaling activities under Alternative 2 would be minor in magnitude at the population level, localized in geographic extent, and periodic, short-term in duration/frequency. The disturbance effect would be considered minor at the population level.

It is important to note that because the IWC Schedule requires unused strikes to be carried forward and added to the strike quotas of subsequent years, subject to limits, this alternative would be contrary to the Schedule and to U.S. law.

Alternative 3

Alternative 3 would allow NMFS to grant the AEWC the U.S. portion of an annual strike limit of 82 bowheads struck (67 strikes + up to 15 unused strikes carried forward from previous years) per year, not to exceed the U.S. portion of a maximum total of 336 landed whales over any six-year period. No more than 15 additional unused strikes from any prior year are added to any one year's allocation of strikes.

This alternative would maintain the status quo for any six-year period with respect to management of the hunt. The maximum annual mortality could be 82 whales, (67 strikes + up to 15 unused strikes carried forward), subject to a maximum total of 336 landed whales over any

[29] As discussed in Section 2.0, the U.S. and Russian Federation agree annually on the total number of strikes that Alaska Natives and natives from Chukotka are each allowed to use. For purposes of this FEIS, the maximum combined mortality is analyzed.

six-year period. The direct and indirect effects of Alternative 3 on the bowhead whale population would be negligible. The magnitude, geographic extent, and duration/frequency of this level of mortality are considered negligible for the bowhead population. Effects of human activities are localized and timed to coincide with the presence of whales during spring and autumn migrations. The disturbance to the whales from subsistence whaling activities under Alternative 3 would be considered minor at the population level, and comparable to those identified under Alternative 2.

Alternative 4 (Preferred Alternative)

Alternative 4 would allow NMFS to grant the AEWC the U.S. portion of an annual strike limit of 100 bowheads (67 strikes + up to 33 unused strikes carried forward from previous years), not to exceed the U.S. portion of a total of 336 landed whales over any six-year period. Up to 33 unused strikes from previous years can be carried forward, subject to limits, and added to the annual strike quota of subsequent years, provided no more than 50 percent of the annual strike limit (33 strikes) is added for any one year. This Alternative is consistent with the IWC's 50 percent carryover principle[30].

Under this alternative, the maximum annual mortality could be 100 whales, (67 strikes plus up to 33 unused strikes carried forward), subject to a maximum total of 336 landed whales over any six-year period. This level of mortality is considered negligible in magnitude for the bowhead population (**Table 4.1-1**), in light of current abundance and growth trends (**Section 3.2.1**). The extent and duration of the effects under this alternative are the same as those for Alternative 3, so the overall impact of this alternative is also rated negligible. Human activities associated with this alternative would be identical to those associated with Alternative 3. Effects of human activities are localized and timed to coincide with the presence of whales during spring and autumn migrations. The disturbance to the whales from subsistence whaling activities under Alternative 4 would be minor in magnitude, localized in geographic extent, and periodic, short-term in duration/frequency. The disturbance effect would be considered minor at the population level.

[30] As described in Sections 1.2.2 and 3.2.1, in 2002, the IWC adopted a "Strike Limit Algorithm" (SLA) for Western Arctic bowhead whales to calculate appropriate levels for the strike limit (IWC, 2003a, b) that would achieve IWC management goals, including stock conservation, in a very wide range of scenarios. In 2017, the IWC's Scientific Committee reiterated its previous agreement that SLAs are robust with respect to a 50 percent inter-annual variability within blocks and to the same 50 percent allowance between the last year of one block and the first year of the next (2017 IWC Scientific Committee Report at 23.) In 2018, the IWC's Scientific Committee advised that, for Western Arctic bowhead whales, the provisions allowing for the carry forward of unused strikes from the previous three blocks, subject to the limitation that the number of such carryover strikes used in any year does not exceed 50 percent of the annual strike limit, has no conservation implications (2018 IWC Scientific Committee Report at 21).

Alternative 5

Alternative 5 would allow NMFS to grant the AEWC the U.S. portion of an annual strike limit of 150 bowheads (100 strikes + up to 50 unused strikes carried forward from previous years), not to exceed the U.S. portion of a total of 504 landed whales over any six-year period. The Bowhead SLA has not been used to assess this level of impact; however, NMFS's issuance of these catch limits would be subject to IWC requirements, which will in turn, be based on IWC Scientific Committee advice on the sustainability of these catch limits., NMFS assumes that the SLA would provide conservative management advice and meet IWC objectives for the management of stocks subject to aboriginal subsistence takes (cf. IWC, 1999).

While the Bowhead SLA has not been used to assess the harvest levels of Alternative 5, PBR can be used to assess the impacts of a harvest of up to 150 bowheads per year, not to exceed a total of 504 landed whales over any six-year period. This level of take would be below the 2016 PBR of 161 animals, and would have a minor impact.

In addition, the 2006 catch control rule Q indicates a take below Q_{low} of 155 whales per year would be considered to be a minor impact. Given that the Western Arctic bowhead whale abundance estimates have increased since the 2006 stock assessment, there is no reason to think that a current estimate of Q_{low} would be any lower today if a revised assessment were conducted.

Therefore, the direct and indirect effects of Alternative 5 on the bowhead whale population would be minor. The impact of this level of take, i.e., up to 150 whales per year, which includes the maximum carryover of unused strikes, on the Western Arctic stock of bowhead whales would be less than 1 percent of the current population estimate of 16,820 animals. The population would still likely increase in numbers, albeit at a lower rate. The magnitude, geographic extent, and duration/frequency of this level of mortality are considered minor for the bowhead population. Effects of human activities are localized and timed to coincide with the presence of whales during spring and autumn migrations. The disturbance to the whales from subsistence whaling activities under Alternative 5 would be minor in magnitude, localized in geographic extent, and periodic, short-term in duration/frequency. The disturbance effect would be considered minor at the population level.

4.5 Direct and Indirect Effects of the Alternatives on Individual Bowhead Whales in the Project Area

Under the action alternatives, hunting activities associated with Alternatives have the potential to directly affect struck whales and to indirectly affect bowhead whales that are not being directly harvested. This includes noise associated with ASW hunting practices, the presence of vessels and other underwater noise. The sound of harpoon bomb detonations during a strike is audible for several kilometers. Acousticians listening to bowhead whale calls as part of the census report that calling rates decrease for a brief period after a detonation (C. W. Clark, Cornell Laboratory of Ornithology, Pers. comm.). The range at which whales may be affected is unknown and will vary with environmental conditions (e.g., depth of water, ambient noise levels, ice conditions, bottom structure) and the depth at which the bomb detonates.

According to Alaska Native Traditional Ecological Knowledge (TEK), after a harpoon bomb detonation, some whales act “skittish” and wary (E. Brower, Barrow Whaling Captain’s Association President, Pers. comm.). Whales temporarily halt their migrations, turn 180 degrees away from the disturbance (i.e., move back through the lead systems), or become highly sensitized as they continue migrating (E. Brower, Barrow Whaling Captain’s Association President, Pers. comm.). These changes in migratory behavior in response to disturbance are short-term, as several whales are often landed at whaling villages such as Utqiaġvik (Barrow) in a single day (George, 1996).

In this respect, the indirect disturbance effects on individual whales will be negligible in magnitude, extent, and duration/frequency under Alternative 1, since under this alternative no subsistence whaling by Alaska Natives would occur. Under Alternatives 2, 3, 4, and 5, subsistence whaling would occur with negligible mortality and minor disturbance effects at the population level, as described in **Section 4.4**. With respect to disturbance effects to individual bowhead whales, the magnitude, extent, and duration of the associated disturbance effects would also be minor.

4.6 Cumulative Effects of Other Activities in or near the Project Area on the Western Arctic Bowhead Whale Stock

Cumulative effects are the effects on the environment which result from the incremental impact of the proposed action when added to other past, present, and reasonably foreseeable future actions (RFFAs) regardless of what agency (federal or non-federal) or person undertakes such other actions (40 CFR 1508.7). Cumulative effects can result from individually minor but collectively significant actions taking place over a period of time. The ultimate goal of identifying cumulative effects is to provide for informed decisions that consider the total effects (direct, indirect, and cumulative) of the proposed action to provide for a multi-year block catch limit for the subsistence harvest of bowhead whales.

In the following section, past, present, and reasonably foreseeable future actions occurring in or near the project area that cumulatively affect bowhead whales are discussed. Subsequent sections address the direct, indirect and cumulative effects of the alternatives on other wildlife (**Section 4.8 and Section 4.9**), and direct, indirect and cumulative effects of the alternatives on the sociocultural environment (**Section 4.10**).

4.6.1 Effects of Offshore Oil and Gas Activities in the Project Area

4.6.1.1 Past and Present Offshore Oil and Gas Activities in the Project Area

Past and present oil and gas activities considered in the cumulative case include the following: any historical actions related to exploration, development, or production that have ongoing effects on the FEIS project area; construction and ongoing maintenance of present infrastructure support facilities and transportation systems; and any other oil and gas activities that affect the FEIS project area and are currently underway. These activities include projects or actions that may occur in a broader geographic area than the FEIS project area, in any stage of development.

Onshore oil development has been the main agent of industrial change on the North Slope and throughout the Arctic Outer Continental Shelf (OCS) in the twentieth and twenty-first centuries. Although Iñupiat people used oil from seepages as fuel prior to Western contact, the U.S. Navy and the U.S. Geological Survey (USGS) conducted the first modern program of oil and gas exploration on the North Slope during the 1940s and 1950s. Oil production started at Prudhoe Bay in 1977, and has occurred for over 40 years in the region. It presently spans from Alpine in the west to Point Thomson in the east. Associated industrial development has included the creation of industry-supported community airfields at Deadhorse and Kuparuk, and an interconnected industrial infrastructure that includes roadways, pipelines, production and processing facilities, gravel mines, and docks (BOEM 2017, page 5-3).

Federal leasing on the North Slope, which began in 1958, led to several industry-sponsored exploration programs. The discovery of oil at Prudhoe Bay in 1968, followed by discoveries at Kuparuk, West Sak, and Milne Point in 1969, marked the beginning of commercial oil development in the region (National Research Council [NRC], 2003). Completion of the Trans-Alaska Pipeline System (TAPS) in 1977 allowed year-round transport of North Slope oil to the marine terminal in Valdez and efficient shipment to market. Leasing of state and federal offshore continental shelf areas began in 1979, and offshore discoveries were made at Endicott, Sag Delta, Point McIntyre, Niakuk, and Northstar (NRC, 2003).

The Point McIntyre and Niakuk pools are located mostly in the offshore area, but their production facilities are located onshore (MMS, 2008). Endicott Island, built in 1987, was the first continuously producing offshore oil field in the Arctic. The Northstar offshore island for oil production was constructed in 1999-2000. Northstar, Nikaitchuq and Ooguruk developments currently operate in nearshore areas of the Beaufort Sea, and is expected to continue operating in the future. Construction of the artificial island to facilitate the offshore Liberty project is planned to commence in 2018.

TAPS throughput peaked in 1988 at nearly 2.1 million barrels per day. Although the overall trend has been one of declining throughput (down to 540,000 barrels per day in 2017), however production did increased in 2016 and 2017 (Alaska Oil and Gas Association, 2018).

For additional information on past, present, and future oil and gas exploration and development in the Beaufort and Chukchi seas, please refer to following:

- Environmental Assessment – Shell Offshore Inc. [Shell], Beaufort Sea Exploration Plan, 2007-2009 (MMS, 2007b).
- Draft Environmental Impact Statement – Beaufort and Chukchi Sea Planning Areas Oil and Gas Lease Sales 209, 212, 217, and 221 (MMS, 2008) (hereafter "Arctic Multiple-Sale Draft EIS").
- Environmental Assessment – For the Issuance of Incidental Harassment Authorizations to Take Marine Mammals by Harassment Incidental to Conducting Open Water Seismic and Marine Surveys in the Beaufort and Chukchi Seas. July 2010. (NMFS, 2010).
- Final Supplemental Environmental Impact Statement – Chukchi Sea Planning Area, Oil and Gas Lease Sale 193 (Bureau of Ocean Energy Management, Regulation and Enforcement [BOEMRE], 2011a).
- Draft Environmental Impact Statement – Effects of Oil and Gas Activities in the Arctic Ocean (NMFS, 2011).
- Point Thomson Project Draft Environmental Impact Statement. (U.S. Army Corps of Engineers [USACE], 2011).
- Statoil Shallow Hazard Surveys in the Chukchi Sea, Alaska (2011)
- Final Environmental Impact Statement – Outer Continental Shelf Oil and Gas Leasing Program: 2012- 2017 (Bureau of Ocean Energy Management [BOEM], 2011).
- Seismic exploration by BP in Simpson Lagoon, Beaufort Sea, Alaska (2012)
- Shell Exploration Drilling Program in the Chukchi Sea, AK (2012)
- TGS 2D Seismic Survey in the Chukchi Sea (2013)

- Shell Geophysical Surveys, Equipment Recovery, and Maintenance Activities in the Chukchi Sea, Alaska (2013)
- SAExploration, Inc. (SAE) 3D OBN Open-Water Seismic in Colville River Delta, AK (2014)
- BP Exploration (BPXA) Shallow Geohazard Survey Foggy Island Bay, Beaufort Sea, AK (2014)
- BP Exploration (BPXA) 3D OBS Open-Water Seismic Survey Prudhoe Bay, Beaufort Sea, AK (2014)
- SAExploration, Inc. (SAE) 3D OBN Open-Water Seismic Beaufort Sea, AK (2015)
- Hilcorp Shallow Geohazard and Strudel Scour Surveys in Foggy Island Bay, Beaufort Sea, AK (2015)
- Shell Exploration Drilling Program in the Chukchi Sea, AK (2015)
- Shell Ice Overflight Surveys in the Beaufort and Chukchi Seas, AK (2015)
- Liberty Oil and Gas Development and Production Plan Activities, Beaufort Sea, Alaska (2018)

Lease Sales. Ten federal lease sales for the Outer Continental Shelf (OCS) have been held in the Beaufort Sea planning area since 1979. Active federal leases include seven leases from Sale 186 (15,217 hectares), 83 leases from Sale 195 (170,464 hectares), and 89 leases from Sale 202 (196,276 hectares) in the Beaufort Sea.

Three federal lease sales for the OCS have been held in the Chukchi Sea planning area between 1979 and 2017. Six exploration wells were drilled in the Chukchi Sea between 1989 and 2017, but no commercial production has occurred in the Chukchi Sea planning area.

Chukchi Sea Lease Sale 193, held in February 2008, resulted in the sale of 487 leases totaling approximately 2.8 million acres in the Chukchi Sea Planning Area (BOEMRE, 2011a). As is the case elsewhere, development on leased areas is subject to conditions to mitigate operational and environmental risks, including: protection of biological resources; orientation programs to familiarize personnel with environmental, social, and cultural issues; environmental requirements regarding the placement of pipelines; precautionary action to mitigate potential oil spill impacts; and measures to minimize the effects to threatened and endangered species. BOEM has also required specific mitigation measures for the corridor of leases closest to the coastline, including a corridor 83.6 km (52 mi.) from the shore in which no lease activity will take place, site-specific monitoring programs to assess behavioral effects on marine mammals, and conflict avoidance mechanisms to protect subsistence harvesting activities (BOEMRE, 2011a).

Seismic Survey and Site Clearance Activities. Seismic work in the Arctic has traditionally been conducted in ice-free months (July through November), although surveys utilizing an icebreaker could potentially continue through mid-December. Seismic surveys are also conducted on-ice in areas where there is bottom-fast ice in the winter. These surveys generally occur from January through May. Each survey takes between 30 and 90 days, depending on many factors, including ice conditions, weather, equipment operations, size of area to be surveyed, and the timing of subsistence hunts.

Site clearance and shallow hazards surveys are usually of lesser concern regarding impacts to cetaceans than deep two-dimensional (2-D)/three-dimensional (3-D) surveys (NMFS, 2010) because they typically use smaller sized air gun arrays. The potential for cumulative adverse impacts to marine mammals from seismic surveys and site clearance activities can be mitigated by implementing well-designed monitoring plans and carefully constructed mitigation measures. Since 1986, the AEWC has collaborated with developers in crafting Conflict Avoidance Agreements (CAA), whereby parties jointly develop mitigation measures intended to reduce adverse impacts to subsistence hunting opportunities, as well as direct and cumulative impacts to bowhead whales and bowhead whale habitat.

Seismic surveys for exploration purposes in state waters are authorized under Geophysical Exploration Permits subject to 11 Alaska Administrative Code (AAC) 96.010 through 96.250, Miscellaneous Land Use Regulations, and the attached stipulations. However, seismic surveys conducted for other purposes, such as shallow hazard assessments, do not require permits unless they are not conducted from the ice and/or involve contact with the seafloor (MMS, 2006b).

Offshore oil and gas exploration programs have operated in the Alaskan Chukchi Sea since the 1950s, although the extent of these activities has been significantly less than that in the Beaufort Sea, and has seen much variation among years (MMS, 2006b; Shell, 2011). MMS-permitted seismic surveys have been conducted in the Chukchi and Beaufort seas since the late 1960s/early 1970s.

As previously indicated, in 2015, SAExploration, Inc. conducted 3D OBN Seismic exploration in the Beaufort Sea and Hilcorp conducted a shallow hazard and strudel scour survey in Foggy Island Bay in the Beaufort Sea in 2015. In 2014, BP Exploration Alaska, Inc. (BPXA) completed a 3D Ocean Bottom Node (OBN) Seismic Survey in the North Prudhoe Bay area and SAExploration, Inc. completed an on-ice 3-D Seismic Survey extending from onshore Alaska across nearshore State waters into the Beaufort Sea OCS. In 2012, Ion Geophysical Corporation completed a 2-D Seismic Survey across a large swath of the Beaufort Sea OCS and extending into the Chukchi Sea OCS. Other less recent Beaufort Sea OCS surveys include one 3-D survey each by Shell and BPXA in 2008 and three surveys by Shell in 2007 (one 3-D marine seismic, one 3-D on-ice seismic, and one high resolution shallow seismic survey.)

More recent seismic exploration activities were conducted by industry in the Alaskan Chukchi Sea in 2006–2010. The total number of miles of vessel track line associated with seismic survey activities in the Chukchi Sea was greatest in 2006 (Funk et al., 2010). Similar amounts of seismic survey activities occurred in the Chukchi Sea from 2006-2010 compared to what occurred from 1980-1991.

In the 1980s, five high-resolution site-clearance surveys were conducted in the Chukchi Sea OCS prior to five exploration wells being drilled. Between 1970 and 1975, 12 MMS G&G (geological and geophysical) permits were issued for Chukchi Sea 2-D marine seismic surveys, but none between 1976 and 1979.

Site Clearance Survey Activities. High-resolution site-clearance surveys in the Beaufort and Chukchi Sea OCS precede the drilling of exploration wells. Additional site-clearance surveys may have been conducted for other activities as well (e.g., island or dock construction).

Oil and Gas Exploration and Development. Since the discovery and development of the Prudhoe Bay and Kuparuk oil fields, more nearshore oil fields have been tapped from terrestrial sites. Notable exceptions include Northstar, Endicott, and Lisburne fields. Endicott Field was developed using causeways whereas the Lisburne Field was developed using directional drilling from shore. The Ooguruk Field, developed by Pioneer Natural Resources Alaska in nearshore waters off of Oliktok Point, uses horizontal drilling to access oil in several different areas from a single location on the surface. The Ooguruk field began production in 2008.

Similarly, oil production began at the Nikaitchuq field in February 2011. The Nikaitchuq field is located in the nearshore waters of the Beaufort Sea northwest of Prudhoe Bay in approximately 3 meters of water. Field development at the Nikaitchuq field started in 2008. Eni (an Italian multinational oil and gas company) plans to drill one-third of the wells from shore and the remainder from an artificial island to be constructed about 2.8 mi. from shore in Phase 2 of the field's development. A 6.1 km-long (3.8 mi.-long) under seabed pipeline bundle, which is the heaviest bundle ever installed in the Arctic, connects the offshore facility to the onshore facilities.

Five exploration wells were drilled in OCS waters of the Chukchi Sea in the 1980s, and an additional well was drilled in 2015. There are currently no operating oil or gas facilities in the

Chukchi Sea Planning Area.

<u>Drilling</u>. There are 38 past and present U.S. Arctic Oil and Gas fields and satellite fields in Alaska (BOEM 2017, page 5-4). Recent exploration drilling has occurred in both the Beaufort and Chukchi Sea OCS, as well as in the nearshore state waters of Smith Bay in the Beaufort Sea. In 2012, Shell Offshore, Inc. proposed exploration of two new prospects in Camden Bay, the Sivulliq and Torpedo prospects. Though four wells were permitted, only one well was drilled. The well targeted the Sivulliq prospect BOEM Liberty Development and Production Plan EIS Cumulative Effects 5-5 approximately 16 miles offshore. Prior to penetrating potentially oil-bearing zones, Shell ceased drilling, and the well was temporarily abandoned and the exploration program was terminated.

In 2012, Shell Gulf of Mexico, Inc. also attempted exploration of the Burger prospect approximately 60 miles from shore in the Chukchi Sea OCS. As with the Sivulliq well, Shell ceased drilling, temporarily abandoned the well, and terminated the exploration program prior to penetrating the potentially oil-bearing Burger prospect. Shell returned to the Burger prospect in 2015 to drill a new exploration well, this time reaching the Burger prospect and confirming a lack of economically producible oil. The well was plugged and abandoned and Shell later relinquished all Chukchi Sea OCS leases. After relinquishments by other Chukchi Sea OCS lessees, there are currently no remaining Chukchi Sea leases issued in Lease Sale 193.

In 2016, Caelus Energy Alaska, LLC (Caelus) drilled two exploration wells into the Tulimaniq prospect on nearshore State of Alaska leases in Smith Bay approximately 59 miles southeast of Utqiaġvik (Barrow) in the Beaufort Sea. By October 2016, Caelus announced it has made an oil discovery estimated at 200,000 barrels per day of light, highly mobile oil. The recovery rates, if correct, would put the field's estimated oil potential between 1.8 billion barrels and 4 billion barrels. By way of comparison, Prudhoe Bay oil field was originally estimated to have 25 billion barrels. Additional well testing would tell more about potential production rates.

<u>Noise</u>. In both the Beaufort and Chukchi seas lease areas, bowhead whales can be affected by combined effects of noise and activity from all of these sources in nearshore waters, including seismic activity, site-clearance seismic surveys, drilling, and other oil and gas development activity. As a result, whales may exhibit avoidance behavior resulting in short-term displacement from traditional migration routes, thereby making it harder for subsistence hunters to hunt, and to retrieve harvested whales.

The spring season appears to be a particularly critical period in the bowheads' annual cycle. This is the time most, if not all, of the population migrates through areas covered by dense ice where migration routes are constrained and most likely to be affected by elevated sound sources (Richardson et al., 1995a,b). Studies have defined anthropogenic impact as a function of the extent that industrial activities coincide with the bowhead whales' seasonal occupation of certain regions and the whales' tolerance level of the impacts (Richardson and Malme, 1993; Bratton et al., 1993). Exposure to anthropogenic sound and contaminants may produce short and long-term effects (Richardson and Malme, 1993; Bratton et al., 1993). However, Richardson and Malme (1993) state that data are not available to assess long-term impacts. Further, research in 1996 through 1998 showed that some seismic noise can deflect autumn migration of bowheads to farther offshore (Miller et al., 1999; Richardson, 1999; Richardson et al., 1999). Residents of the Arctic have expressed concern regarding the cumulative and long-term effects of anthropogenic noises on Western Arctic bowhead whales (Ahmaogak, 1985; 1989).

> *Our observations, proven correct time and again by scientific research, are that bowhead whales change their behavior when industrial activity is taking place in their usual habitat. Because of these changes in behavior, the whales become less available or completely unavailable to our hunters during the time the activity is occurring, due both to noise disturbance and to pollution in the water. We also are very concerned that some habitats might be abandoned altogether if industrial activity increases or if it is undertaken in a way that creates ongoing disturbance.* -- Harry Brower, representing the AEWC, in written comments on NMFS (2011) dated April 9, 2010.

As noted in **Section 3.2.8** of this FEIS, the effects of oil and gas activities on bowhead whales are discussed at length in several documents: NMFS (2013), BOEMRE (2011), BOEM (2015, 2016), NMFS (2015a, b) with additional information presented on the BOEM Alaska OCS Region website: https://www.boem.gov/Alaska-Region/. NMFS (2006) concluded that the effects from an encounter with aircraft generally are brief and whales should resume their normal activities within minutes (Patenaude et al., 2002). Bowheads may exhibit temporary avoidance behavior to vessels at distances of 1 to 4 km. Many earlier studies indicate that most bowheads exhibit avoidance behavior when exposed to sounds from seismic activity. Bowheads also exhibited tendencies for reduced surfacing and dive duration, fewer blows per surfacing, and longer intervals between successive blows. Alaska Native whalers have stated that noise from seismic surveys and some other activities at least temporarily displaces whales farther offshore, especially if the operations are conducted in the main migration corridor (MMS, 2006b).

Mitigation measures developed through this process have increased hunter safety from industry vessel traffic through the establishment of industry-funded communications centers and mitigated adverse impacts to the availability of bowhead whales for subsistence hunting. Measures to reduce both direct and cumulative adverse impacts to bowhead whales and bowhead whale habitat have been implemented. In a March 1997 workshop on seismic-survey effects conducted by MMS (now BOEM) in Utqiaġvik (Barrow), Alaska, with subsistence hunters from the communities of Utqiaġvik (Barrow), Nuiqsut, and Kaktovik, hunters agreed on the following statement concerning the "zone of influence" from seismic-survey noise:

> *Factual experience of subsistence whalers testify that pods of migrating bowhead whales will begin to divert from their migratory path at distances of 35 miles from an active seismic operation and are displaced from their normal migratory path by as much as 30 miles* (MMS, 2008).

Monitoring studies of 3-D seismic exploration in the nearshore Beaufort Sea during 1996-1998 demonstrated that nearly all bowhead whales will avoid an area within 20 km of an active seismic source (Richardson et al., 1999). Using airgun arrays with 6 to 16 airguns and total volumes ranging from 9.2 liters to 24.6 liters (560 to 15000 cubic inches), sound levels received by bowhead whales ranged from 117 - 135 dB re 1 μPa (rms) at 20 km, and from 107-126 dB re 1 μPa (rms) at 30 km from the source (Richardson et al., 1999). Data from monitoring seismic operations from 1996 through 1998 suggested that the offshore displacement may have begun roughly 35 km (19 n. mi. or 22 statute miles [st. mi.]) east of the activity and may have persisted more than 30 km to the west (Richardson et al., 1999). Bowheads reoccupied the area within 12-24 hours after seismic surveys ended (Richardson et al., 1999). It should be noted that the sound levels received by bowhead whales at a given distance from a sound source would depend upon multiple factors, including the source level, frequency, and duration of the sound, all of which may be influenced by the volume and configuration of a particular airgun array. Environmental factors such as water depth, temperature, and seafloor composition would also influence the propagation characteristics of sound through the nearshore Beaufort Sea.

Richardson et al. (1986b) observed feeding bowheads start to turn away from a 30-airgun array with a source level of 248 dB re 1 μPa at a distance of 7.5 km (4.7 mi.) and swim away when the vessel was within about 2 km (1.2 mi.) while other whales in the area continued feeding. More recent studies have similarly shown greater tolerance of feeding bowhead whales to higher sound levels than migrating whales (Miller et al., 2005; Harris et al., 2007). Data from an aerial monitoring program in the Alaskan Beaufort Sea during 2006 to 2008 also indicate that bowheads feeding during late summer and autumn did not exhibit large-scale distribution changes in relation to seismic operations (Funk et al., 2010). This apparent tolerance, however, should not be interpreted to mean that bowheads are unaffected by the noise. Feeding bowheads may be so highly motivated to stay in a productive feeding area that they remain in an area with noise levels that may cause adverse effects (NMFS, 2010). They could be suffering increased stress by staying in a location with very loud noise (MMS, 2008).

Bowheads have been sighted within 0.2 - 5 km of drill ships, although bowheads change their migration speed and swimming direction to avoid close approach to noise-producing activities, vehicles and structures. During autumn migration, bowheads may avoid drill ships and their support vessels at 20 - 30 km. It has been predicted that roughly half of the bowheads would respond at a distance of 4.6 - 20 km when the signal-to-noise ratio is 30 dB (Richardson et al., 1995a). These types of observations have been reported by subsistence whalers. As indicated by Thomas Brower, Sr. on October 1, 2008 in the Arctic Multiple Sale document (MMS, 2008):

> *The whales are very sensitive to noise and water pollution. In the spring whale hunt, the whaling crews are very careful about noise. In my crew, and in other crews I observe, the actual spring whaling is done by rowing small boats, usually made from bearded sealskins. We keep our snow machines well away from the edge of the ice so that the machine sound will not scare the whales. In the fall, we have to go as much as 65 miles out to sea to look for whales. I have adapted my boat's motor to have the absolute minimum amount of noise, but I still observe that whales are panicked by the sound when I am as much as 3 miles away from them. I observe that in the fall migration, the bowheads travel in pods of 60 to 120 whales. When they hear the sound of the motor, the whales scatter in groups of 8 to 10, and they scatter in every direction.*

Available scientific information, however, does not indicate that oil and gas-related activity (or any recent activity) has had detectable long-term adverse population-level effects on the health, status, or recovery of the bowhead population (MMS, 2006b). Potential impacts of individual activities associated with oil and gas exploration on bowhead whales would represent disturbance effects are mostly of moderate intensity (i.e., noticeable change in localized distribution), minor duration (i.e., periodic, temporary, or short-term) and moderate frequency (i.e. moderately frequent or intermittent), and minor to moderate geographic extent (i.e., effect limited to one or several locations) (**Table 4.1-1**). Taking these ratings of the three impact components together, and with consideration given to reduced adverse impacts through the implementation of mitigation measures, the overall impact to bowhead whales is likely to be minor to moderate (NMFS, 2011). Data indicate that the bowhead whale population has continued to increase over the timeframe that oil and gas activities have occurred and that there is no evidence of long-term displacement from habitat (MMS, 2006b).

4.6.1.2 Reasonably Foreseeable Future Offshore Oil and Gas Activities

Reasonably foreseeable oil and gas activities are discussed in detail in BOEM's recent Liberty EIS (BOEM 2018), and include the following projects: Point Thompson, Greater Prudhoe Bay/Kuparuk/State Offshore Areas, Alpine CD-5, Greater Mooses Tooth, Smith Bay, Pikka Unit and Nanushuk. Pipeline construction projects which are reasonably foreseeable include the Alaska LNG project and the Alaska Stand Alone Gas Pipeline. Both of these pipeline projects would transport gas from the North Slope to Southcentral Alaska (BOEM 2017).

Lease Sales. In their current lease sale plan, BOEM plans to hold Beaufort Sea oil and gas lease sales in 2019, 2021, and 2023, and Chukchi Sea oil and gas lease sales in 2020, 2022, and 2024. A Hope Basin lease sale, covering OCS waters between Point Hope and Wales, Alaska, is planned for 2023, as is a Norton Basin lease sale, covering OCS waters from Point Hope south to 63^o N latitude.

Seismic Survey and Site Clearance Activities. Future seismic surveys and site clearance activities in the Beaufort and Chukchi Seas are reasonably foreseeable, and include a planned 3-D survey of the Barrow Arch region.

Noise. Anthropogenic industrial activities during bowhead whale migration could add to the small amounts of noise and disturbance incurred by subsistence hunting activities. Such industrial activities could affect bowhead distribution and habitat use (MMS, 2006c). In addition, impacts to subsistence hunting practices may result from the presence of industrial noise, water pollution, and other stressors that may disturb/deflect whales and other subsistence resources.

Whales disturbed by noise and activity from all sources in nearshore waters could experience short-term displacement from migration routes to areas farther offshore. The available data on reaction to noise and disturbance do not indicate any lasting population–level effect on bowheads, based on the level of activity in the Beaufort and Chukchi since the 1970s (NMFS, 2006). However, the cumulative effects of these future- noise-generating activities are less certain. As sea ice retreats due to climate change, drill ships and seismic exploration vessels will have access to areas where they were previously excluded at certain times of the year, which may contribute to an increased exposure of bowheads to future offshore oil and gas activities. However, it is not clear whether such potential changes in the distribution of seismic efforts, site-clearance activities, or development activities would coincide with potential changes in the distribution or migratory movements of bowheads due to climate change.

Overall, bowheads exposed to noise producing activities, including subsistence hunting, marine and aircraft traffic, and oil and gas activities, most likely would experience temporary, nonlethal behavioral effects, such as avoidance behavior. Effects could potentially be longer term, if sufficient oil and gas activity were to occur in a localized area such that whales were excluded from preferred habitat. However, long-term displacement of bowhead whales as a result of human activity has not been demonstrated (MMS, 2007a). Cumulative effects of disturbance from noise are currently considered minor at the population or stock level. Detailed discussions of the contribution of effects of oil and gas activity to the overall cumulative effects on bowhead whales are presented in the 2013 Arctic Region Biological Opinion for Oil and Gas Activity in the Beaufort and Chukchi Sea (NMFS, 2013), the 2007 Chukchi Oil and Gas Lease Sale 193 Final EIS (MMS, 2007a), along with both of the supplemental EISs for this project (BOEMRE, 2011, BOEM 2015). Analyses of the effects of noise on bowhead whales, including the effects of noise from seismic exploration and descriptions of mitigation and monitoring measures for protecting marine mammals and the availability of marine mammals for subsistence uses, are presented in the Environmental Impact Statement - Outer Continental Shelf Oil and Gas Leasing

Program: 2017 - 2022 (BOEM, 2016).

Oil and Gas Exploration and Development. Activities on new and existing leases in the Beaufort Sea are expected to continue in the near future. There are no known exploration or development operations planned in the Chukchi Sea. Exploration and development activities may include drilling, the construction and installation of islands and pipelines from offshore production facilities, and expansion of existing offshore and shore-based facilities to accommodate natural gas production.

Eni US intends to drill four exploration wells into the federal submerged lands of the Beaufort Sea from its Spy Island Drillsite, a pre-existing facility located in Alaska state waters (https://www.boem.gov/press07122017/, accessed March 11, 2018). TGS (a geoscience data company) plans to conduct seismic explorations off the Colville Delta in the Beaufort Sea Barrow Arch region, Alaska as early as summer 2018 and 2019.

Liberty**:** The Liberty Project is located on the eastern end of the Prudhoe Bay area, in nearshore waters of Prudhoe Bay. The project will be a self-contained offshore drilling and production facility located on a 9.3 acre artificial gravel island to be called the Liberty Development and Production Island (LDPI), with a pipeline to shore. Once the LDPI is constructed, multiple production and disposal wells are expected to be drilled from that island during subsequent years. Associated onshore facilities and activities to support the Liberty Project would include ice road construction, construction of gravel pads to support the pipeline tie-in location and Badami ice road crossing, ice pad construction, construction of a hovercraft shelter and small boat dock, and development of a gravel mine site west of the Kadleroshilik River.

Point Thomson**:** ExxonMobil has completed the initial phase of developing this field on the eastern North Slope. Point Thomson is a gas condensate field that is currently producing condensate and shipping it via a 22-mile oil pipeline to Pump Station 1 on the TAPS. Current estimated recoverable condensate resources are 200 million bbl. First oil production from Point Thomson began in May 2016. Peak production from the first stage of development at this facility is estimated at 10,000 barrels per day (bpd). The drillsite and production facilities are located on state onshore lands just west of the Alaska National Wildlife Refuge with long-reach wellbores drilled more than 1.5 miles into the nearshore waters of the Beaufort Sea. The project includes production pads, process facilities, an infield road system, a pipeline, infield gathering lines, and an airstrip. To avoid offshore development and potential impacts on the marine environment, onshore drilling pads were selected to enable directional drilling to offshore locations.

Greater Prudhoe Bay/Kuparuk/State Offshore Areas**:** This main producing part of the Alaska North Slope is expected to have numerous small developments as smaller reserves of oil are discovered and can be produced using existing infrastructure. Product from these developments would flow from existing facilities into Pump Station 1 of TAPS. The timing of these developments would be scattered over the next 10 years.

In 2012, ConocoPhillips Alaska, Inc. (COPA) drilled a successful appraisal well into an undeveloped section of the Kuparuk formation on the southwest flank of the Kuparuk field and began construction of a new drill site in 2014. Named Drill Site 2S, this was the first new drill site in Kuparuk in 12 years. Construction was completed in 2015 and first production flowed in October 2015. Estimated peak production from Drill Site 2S is 8,000 bpd. COPA extended the Kuparuk fields existing Drill Site 1H consisting of five production wells, thirteen injection wells, and associated surface equipment. COPA began production from the 1H-NEWS extension in November, 2017.

To the west of Kuparuk River Unit lies the Mustang oil field, part of the Southern Miluveach Unit now owned by Brooks Range Petroleum Corporation (Brooks Range Petroleum). After construction of a gravel road and drillsite and drilling several development wells starting in early 2015, Brooks Range Petroleum announced the delay of first oil production after encountering mechanical and reservoir problems while drilling. Originally anticipated in 2016, first oil production has been delayed repeatedly, and production was most recently projected to begin in early 2019. The estimated 1,292 barrel per day peak flow field is equipped with a standalone production facility and pipeline on a gravel pad and road, which connects to existing infrastructure at Kuparuk.

Alpine CD-5**:** COPA began construction of the newest Alpine field satellite development drill site named CD-5 in 2014, with plans for 14 production wells and an exploration well. This new drill site is located on Alaska Native village corporation lands near Nuiqsut and is the first commercial oil production from within the National Petroleum Reserve in Alaska (NPR-A). As a satellite to Alpine Central Processing Facility (CPF), CD-5 has only minimal on-site processing facilities but required six miles of gravel road, four bridges, and 32 miles of pipelines including completion of a gravel road and natural gas pipeline from Alpine CPF into Nuiqsut. First production flowed from CD-5 to Alpine CPF in October 2015. It is exceeding its projected peak flow rate of 16,000 bpd, and is currently producing 37,000 bpd.

Greater Mooses Tooth**:** In October 2015, COPA received approval for construction of the Greater Mooses Tooth-1 (GMT-1) project, the first commercial development on Federal lands in the NPR-A. Initially targeting the Lookout oil pool with a total of nine wells, the GMT-1 drill site would host 24 additional wells slots for eventual development of two other oil and gas pools in the Federally-managed Greater Mooses Tooth Unit. The 7.7-mile long GMT-1 road, two bridges, and pipelines would connect to Alpine CPF through the existing CD-5 road and pipeline extension. First oil production is expected in late 2018, with peak flow projections of 30,000 bpd.

In August 2015, COPA announced submission of applications for construction of the Greater Mooses Tooth-2 (GMT-2) project on Federal lands in the NPR-A. If approved, GMT-2 would target the Spark oil pool with as many as 48 wells drilled from a 14-acre drill site 8 miles to the southwest of GMT-1. The proposed 8.6 mile gravel road and pipeline would connect through GMT-1 and on to Alpine CPF through the existing CD-5 extension. Production estimates are yet to be published but COPA anticipates first oil production by the end of 2020 if permits are approved on schedule.

***Smith Bay Development*:** In 2016, Caelus Energy Alaska (Caelus), made a significant light oil discovery on its Smith Bay state leases on the North Slope of Alaska. Caelus estimates the amount of oil in place to be approximately 6 billion barrels with an additional 10 billion barrels of oil in place when the adjoining acreage is included. Caelus expects to achieve recovery factors in the range of 30-40% due to the favorable fluids contained in the reservoir. According to Caelus, the Smith Bay development has the potential to provide 200,000 barrels per day of light, highly mobile oil that would both increase TAPS volumes and reduce the average viscosity of oil in the pipeline, extending its long-term viability. If developed, this may require constructing a new pipeline. Caelus is currently planning an appraisal program that would include drilling an additional appraisal well and acquiring a new 3D seismic survey additional acreage. The appraisal program would enable Caelus to confirm reservoir continuity, optimize future drilling locations, and ultimately increase reserves. Caelus is also studying and planning the development of facilities to process and transport the oil to TAPS.

***Pikka Unit and Nanushuk Development*:** The Pikka Unit was approved in 2015 to accommodate Repsol and Armstrong Energy’s exploration leases. Wells, referred to as Horseshoe-1 and 1A were drilled on State land during the 2016-2017 winter season in a section of the Pikka Unit known as the Nanushuk Prospect. In 2017, Repsol and Armstrong Energy reported they had discovered the largest U.S. onshore oil discovery in 30 years between the Colville River Unit, the Oooguruk Unit and the Placer Unit in the central North Slope. The Horseshoe discovery wells are located approximately 12 miles south of Nuiqsut and extend the Nanushuk Prospect by 20 miles (32 kilometers).

The Pikka Unit (including the Nanushuk Development) and the Horseshoe discovery apparently contain at least 1.2 billion barrels of recoverable light oil combined. First production for the Pikka Unit from the Nanushuk Development could occur as early as 2021, with a potential rate approaching 120,000 barrels of oil per day. Armstrong Energy, proposing to develop Nanushuk, would target oil deposits in the Alpine C and Nanushuk reservoirs. The project is southeast of the East Channel of the Colville River, located approximately 52 miles west of Deadhorse and about 6.5 miles from Nuiqsut (at the southernmost location of the Nanushuk Project). The project would include construction of the Nanushuk Pad comprised of Drill Site 1 and a Central

Processing Facility, Drill Site 2, Drill Site 3, an operations center pad, infield pipelines, the export/import Nanushuk Pipeline, infield roads, and an access road.

Alaska (AK) LNG Project**:** The project, still in preliminary engineering and design stages and under environmental review, is a proposal originally put forth by a consortium comprised of major North Slope oil and gas producers ExxonMobil, BPXA, and COPA, along with partners TransCanada and the State of Alaska. The development would include a gas treatment plant at Prudhoe Bay to remove carbon dioxide and other impurities from the gas stream, a 42-inch-diameter, high-pressure, 800-mi (1,287 km) pipeline and eight compressor stations to move the gas to a proposed liquefaction plant at Nikiski, on the Kenai Peninsula. The Nikiski site would include LNG storage tanks and a marine shipping terminal for gas exports. Up to five take-off points for in-state gas delivery are also planned upstream of the Nikiski LNG plant.

The pipeline would be designed to accommodate 3 billion to 3.5 billion cubic feet of gas per day, with an initial mix of gas from the Prudhoe Bay and Point Thomson fields, and room to accommodate other gas fields in the decades ahead. The permitting process is currently projected to extend into 2020. Project financing remains uncertain.

Alaska Stand Alone Gas Pipeline**:** A second partnership, the Alaska Stand Alone Gas Pipeline (ASAP) project, was originally planned as a 24-in diameter natural gas pipeline with a natural gas flow rate of 500 million ft3 per day at peak capacity of consumer grade, “lean gas.” This is to be a reliable, affordable energy source to Alaskan communities. The Alaska Gasline Development Corporation in partnership with TransCanada Corp. has led the planning effort for ASAP. Production from this pipeline would emphasize in-State distribution, although surplus gas would also likely be condensed and exported. According to the USACE, the 727-mile, low pressure ASAP pipeline route would generally parallel the TAPS and Dalton Highway corridor to near Livengood, northwest of Fairbanks. At Livengood, the mainline route would continue south, to the west of Fairbanks and Nenana. The pipeline would bypass Denali National Park and Preserve to the east and would then generally parallel the Parks Highway corridor to Willow, continuing south to its connection into ENSTAR's distribution system at MP 39 of the Beluga Pipeline southwest of Big Lake. The Fairbanks 30-mile Lateral tie-in would be located approximately 2.5 miles south of the Chatanika River crossing at MP 440 of the mainline. From the mainline tie-in point, the Fairbanks Lateral pipeline would traverse east over Murphy Dome, following the Murphy Dome and Old Murphy Dome Roads, and then extend southeast into Fairbanks.

The project is expected to include an underground pipeline with elevated bridge stream crossings, compressor stations, possible fault crossings, pigging facilities, and off-take valve locations. Either pipeline would be designed to transport a highly conditioned natural gas product, and would follow the same general route. A gas conditioning facility would need to be constructed near Prudhoe Bay and would likely require one or more large equipment modules to be off-loaded at the West Dock loading facility. Shipments to West Dock would likely require improvements to the dock facilities and dredging would be needed to deepen the navigational channel to the dockhead. Project proponents are currently seeking authorizations to begin construction of facilities and infrastructure at West Dock near the northern extent of the pipeline in the Prudhoe Bay area.

4.6.1.3 Oil Spills

Oil spills can occur during seismic exploration, exploratory drilling, construction and operation of offshore platforms, and from subsea pipelines. Oil spills are broken down into three general spill-size categories: (1) small spills, those less than 1,000 barrels (bbl); (2) large spills, those greater than or equal to 1,000 bbl, meaning that 1,000 bbl is the threshold size; and (3) very large spills, those greater than or equal to 150,000 bbl (MMS, 2009). This section contains a discussion of the potential environmental effects of a low-probability, high impact event, a hypothetical very large oil spill (VLOS) in the Chukchi Sea or in the Beaufort Sea. The probability of a VLOS is considered to be remote during exploration, but was assessed due to the pronounced effects it might have on bowheads and the potentially higher probabilities of occurrence associated with development and production phases (NMFS, 2006). The analysis of a VLOS also allows NMFS and BOEM to understand possible effects of spills of smaller sizes as well.

In the unlikely event that a VLOS were to occur in the Chukchi Sea, the potential for significant effects on a variety of resource categories would be high. Marine mammal species could be affected depending on the location, timing, duration, sea and climatic conditions, and response to spill events. As described in BOEM Lease Sale 193 Final Second SEIS, the potential physiological effects associated with a VLOS that could lead to reduced marine mammal fitness include:

(1) Irritation, inflammation, or necrosis of skin; chemical burns of skin, eyes, mucous membranes; inhalation of toxic fumes with potential short- and long-term respiratory effects (e.g., inflammation, pulmonary emphysema, infection);

(2) Partial or extensive coating of pelts with oil for polar bears would reduce insulation and could result in hypothermia and ingestion of oil during grooming; either could result in mortalities;

(3) Ingestion of oil (and dispersants) directly or via contaminated prey, leading to inflammation, ulcers, bleeding, damage to liver, kidney, and brain tissues.

(4) Disturbance from beach cleanup crews, vessels and aircraft during spill response and cleanup; and

(5) Oil coating baleen in *mysticetes* whales which could adversely affect baleen functionality in sieving food from sea water.

Complications of the above may lead to reduced fitness, injury and mortalities.

Existing onshore and offshore oil and gas development and production facilities and their associated pipelines have the potential to release industrial chemicals, or to spill oil. Oil spills from offshore production activities are of concern because as additional offshore oil exploration and production – such as the Liberty, Ooguruk, and Nikaitchuq projects – occurs, the potential for large spills in the marine environment increases. In addition to potential oil spills from industry infrastructure, the potential also exists for oil/fuel spills to occur from associated support vessels, fuel barges, and even aircraft (NMFS, 2010). Impacts to marine mammals most likely would include temporary displacement from the area of the spill, and short-term effects on health from the ingestion of contaminated prey (MMS, 2007a). Drilling for oil and gas in the Arctic generally occurs from natural and artificial islands, caissons, bottom-founded platforms, and ships. With varying degrees, these operations produce low-frequency sounds with strong tonal components (NMFS, 2010).

The 2012 - 2017 OCS Oil and Gas Leasing Program Draft Programmatic EIS (BOEM, 2011) includes an assessment of the impacts of a VLOS in the Beaufort Sea. Summaries of relevant information from this document are provided in the discussion below. As allowed for by CEQ regulations in §1502.21, NMFS has incorporated the information presented in the BOEM Draft Programmatic EIS (2011) into this FEIS by reference.

Likewise, the BOEMRE Final Supplemental EIS for the Chukchi Sea Oil and Gas Lease Sale 193 (BOEMRE, 2011a) and the 2012-2017 OCS Oil and Gas Leasing Program Draft Programmatic EIS (BOEM, 2011) contain the best information available for assessing the impacts of a VLOS in the Chukchi Sea. The hypothetical VLOS scenario for the Chukchi Sea described in the Lease Sale 193 Final SEIS considers a loss of well control during exploration drilling, which leads to a blowout and an ongoing, high volume release of crude oil and gas that continues for up to 74 days. The total volume of the oil is nearly 2.2 million barrels and the volume of the gas is 1.8 billion cubic feet (Bcf) (BOEMRE, 2011a). Summaries of relevant information from the BOEM documents are provided in the discussion below. As allowed for by CEQ regulations in §1502.21, NMFS has incorporated the information presented in the BOEM documents (BOEMRE, 2011a; BOEM, 2011) into this EIS by reference.

The magnitude and severity of effects of a VLOS on bowhead whales and subsistence harvest practices would depend upon the location, size, and timing of the spill, the type of product spilled, weather conditions, and the environmental conditions at the time of the spill (BOEM, 2011). Bowhead whales may be exposed to spilled oil by direct contact, inhalation, or ingestion of oil or contaminated prey species. In addition, the effects of a VLOS could interact with the effects of other impact-producing factors, such as climate change (**Section 4.6.2.2**), increases in vessel and aircraft traffic (**Section 4.6.3.2**), research activities (**Section 4.6.4.2**), and other development (**Section 4.6.5.2**), potentially resulting in additive or synergistic adverse impacts.

Depending on the timing of the spill, bowhead whales could experience contact with fresh oil during summer and/or fall feeding aggregations and migration in the Chukchi Sea and western Beaufort Sea. Contact with oil could cause irritation and various skin and eye disorders. Exposure of aggregations of bowheads to fresh oil, especially if calves are present, could result in mortality. Surface feeding bowheads could ingest oil with their prey, which might or might not be contaminated with oil components. Bowheads could also ingest oil that might be incorporated into bottom sediments during near-bottom feeding. Ingestion of oil could result in temporary and permanent damage to bowhead endocrine function and reproductive system function, as well as feeding due to baleen fouling (NRC, 2003). If sufficient amounts of oil are ingested, mortality of individuals may also occur. Population level effects are unlikely, but could potentially result from a very low probability, high impact circumstance where large numbers of whales experience prolonged exposure or ingest large amounts of oil (BOEM, 2011).

A winter spill could result in hydrocarbons trapped in and under ice, then released during the bowhead calving and migration period in spring. Some ingestion of surface and near-surface oil fractions could occur during feeding, and could affect endocrine and reproductive performance in adult and juvenile whales. Likewise, an oil spill into ice leads or polynyas in the spring could have devastating effects, trapping bowhead whales where they would be likely to encounter fresh crude oil. Calves would be more vulnerable than adults because they need to surface more often to breathe (BOEM, 2011). In this low probability situation, recovery from the exposure of a substantial portion of a bowhead age class cohort could take decades. Population level impacts to bowheads (as well as other species) are also possible if a VLOS event co-occurred with feeding aggregations during the open water season.

Based on criteria established in **Section 4.1.2.2**, the level of impact to bowhead whales resulting from a VLOS could be major. The duration of effects could range from temporary (e.g., skin irritations or short-term displacement) to permanent (e.g., endocrine impairment or reduced reproduction) and would depend on the length of exposure and means of exposure (direct or indirect ingestion). Effects of direct ingestion of oil is a function of its chemical composition, the quantity ingested, and the degree of weathering prior to ingestion, and other factors that include the health, age, and reproductive status of exposed animals. Displacement of bowheads from areas impacted by the spill due to increased human activity would be likely. If the area is an important bowhead feeding area, such as off Utqiaġvik (Barrow) or Camden Bay, or along the migratory corridor, the magnitude of the effects could be major. The impact of a VLOS on bowhead whales could extend throughout the population and its range.

Human activities associated with oil spill response and cleanup could include vessel and aircraft traffic, icebreaking, wildlife hazing, booming and skimming operations, in-situ burning, dispersant application, drilling of a relief well, research, and monitoring. These activities would likely result in temporary, non-lethal effects to bowheads. Diversion of bowhead whales away from aggregated prey sources could occur, resulting in the loss of important feeding opportunities relative to annual energy and nutrition requirements. Lost feeding opportunities could result in reduced body condition and reproductive performance, increased reproductive interval, loss or abandonment of nursing calves, decreased in vivo and neonatal calf survival, and increased age of sexual maturation in some bowheads. Activities associated with spill response, clean-up, and remediation would not be expected to result in population level effects. Bowheads may avoid vessels at distances of several kilometers depending on the noise energy produced by the vessel. Migrating whales would be expected to divert up to 20 - 30 km around relief well drilling operations. Cetacean protection actions such as hazing would likely be deployed as required, and would be modified to meet the needs of the response effort.

A VLOS in either the Beaufort Sea or the Chukchi Sea could affect subsistence harvest practices by oiling, fouling, and other contamination of subsistence resources, and by the presence of response equipment and personnel. The duration of impacts of a VLOS on subsistence harvests could be long-term to permanent, and the perception that food is tainted and/or contaminated could be long lasting or permanent among Iñupiat communities. As observed after the Exxon Valdez oil spill, the interruption of two to three years of training youth in subsistence harvest practices changed the balance of the subsistence economy for a period persisting well beyond the spill itself.

Overall, the combined probability of a spill occurring and contacting bowhead habitat during periods when whales are present is low. If such an event were to occur, the fraction of the bowhead whale stock affected would vary widely, depending upon the timing and location of the spill and subsequent response. The North Slope Borough (NSB) believes there are some scenarios, such as an oil spill in a spring lead system near Utqiaġvik (Barrow), which could affect a large portion of the population (J. C. George, NSB, Pers. comm., December 20, 2007).

Offshore oil and gas development would not likely cause bowhead mortality, except in the case of a VLOS. Ship strikes and entanglement in commercial fishing gear may contribute to mortality and could affect whales throughout their range. Evidence from harvested whales indicates that entanglement is common (perhaps 10%) but probably temporary for most whales; serious injuries are thought to be relatively rare. The estimated mortality incidental to U.S.

commercial fisheries is 0.2 w hales per year (Allen and Angliss, 2011). The incidence of ship strikes and entanglement could increase in the future depending on the extent to which climate change and sea ice reduction allow for the expansion of fisheries and marine vessel traffic in the Arctic. Considering the aggregated impacts and interactions of past, present, and reasonably foreseeable future actions, the very low level of bowhead mortality from anthropogenic sources other than subsistence whaling efforts (less than one whale per year) is unlikely to cause the population to decline or slow its rate of recovery. The magnitude, geographic extent, and duration of this level of mortality are therefore considered negligible for the bowhead population (**Table 4.1-1**).

The magnitude, geographic extent, duration, and population-level effects of VLOS-caused bowhead mortality are difficult to predict, but could range from negligible to major (**Table 4.1-1**).

4.6.2 Effects of Climate Change in the Project Area

Over the past few decades, evidence of climate change has been reported in a variety of geophysical, biological, oceanographic, and atmospheric parameters (e.g., IPCC 2018, IPCC 2014, Richter-Menge et al. 2017). Scientific evidence indicates that average air, land, and sea temperatures are increasing, and the rate of that increase is accelerating. Global warming is likely to reach 1.5° C between 2030 and 2052 if it continues to increase at the current rate (IPCC 2018). The climate is changing faster in the Arctic than any other region in the world (NOAA, 2014a). Geophysical, biological, oceanographic, atmospheric, and anthropogenic sources provide overwhelming evidence of climate-driven changes in the Arctic in recent decades and it is well established that climate change in the Arctic is occurring two to three times faster than at lower latitudes (Arctic Council 2005; Intergovernmental Panel on Climate Change [IPCC] 2007; USGS 2011, IPCC 2014). Arctic regions have experienced some of the largest climate-driven changes, with major implications for the marine environment and coastal communities.

4.6.2.1 Past and Present Effects of Climate Change in the Project Area

Climate change in the Arctic is causing warmer air and ocean temperatures, decreased duration, extent and thickness of seasonal sea ice, reduced volumes of multi-year sea ice, and changes in the timing and duration of phytoplankton blooms in the Beaufort Sea (USGS 2011; BOEMRE 2011a,b; Druckenmiller et al. 2017). These changes have been attributed to rising CO_2 levels in the atmosphere and corresponding increases in concentrations of CO_2 dissolved in seawater (i.e., ocean acidification).

According to the 2017 Arctic Report Card (Richter-Menge et al. 2017), the second warmest surface air temperature anomaly (+1.6° C relative to 1981-2010) north of 60° N since the year

1900 was observed between October 2016 and September 2017. The warmest surface air anomaly occurred during 2016. Further, on 7 March 2017, satellites observed the lowest winter maximum in sea ice on record (1979-present), while the second lowest winter maximum sea ice extent on record occurred during winter 2017/2018 (National Snow and Ice Data Center 2018). The March, 2017 record low maximum sea ice extent was 8 percent lower and the September, 2017 minimum sea ice extent was 25% lower than the 1981-2010 average. The sea ice cover continues to be relatively young and thin with multiyear ice (more than 1 year old) comprising only 21 percent of ice cover in 2017 compared to 45 percent in 1985. With respect to sea surface temperatures, the Chukchi Sea has experienced the largest warming trend on the planet: ~0.7° C per decade since 1982. In August 2017, the Barents and Chukchi seas experienced surface temperatures up to 4° C warmer than the 1982-2010 average. The most pronounced increasing trends in ocean primary productivity during the 2003-2017 period were observed in the Barents Sea and Eurasian Arctic regions. Long-term records suggest that years with elevated ocean productivity levels are often associated with earlier sea ice breakup during the spring/summer transition.

With respect to terrestrial ice mass and snow cover, the 2017 Arctic Report Card highlighted the downward trend in total ice mass of the Greenland ice sheet averaged over the last 15 years is estimated at 264-270 Gt/yr. The spatial extent of melt for the period June, July and August 2017 reached a maximum of 32.9%, marking the lowest maximum extent since 1996. Further, spring snow cover extent over Eurasia in May 2017 was the second highest recorded by satellite observations dating back to 1967. May and June snow cover extent anomalies over the Eurasian Arctic mark the first positive anomalies observed since 2005 and 2004, respectively. Tundra greenness has increased substantially throughout the Arctic during 2015 and 2016 (the most recent year with a complete data set) following 3-4 years of continuous declines. Peak tundra greenness for 2016 ranks fourth (entire Arctic), 9th (Eurasian Arctic), and third (North American Arctic) in the context of the 35-year satellite record. Permafrost temperatures in 2016 (the most recent set of complete observations) at many observation sites around the Arctic were among the highest on record (as long as 1978-present, but duration of records vary). Increases in permafrost temperature, since 2000, have been greatest in cold permafrost of the Alaskan Arctic, Canadian high Arctic, and Svalbard.

One of the most dramatic changes in the Arctic during the last few decades has been the significant decrease of sea ice during the summer. Thinner sea ice melts faster than thicker ice, so the average thickness of Arctic ice is expected to decrease further, particularly with respect to the extent of the summer ice. The reduction in sea ice has had a significant effect on bowhead whale distribution (Druckenmiller et al. 2017). Bowhead whales are associated with and well adapted to ice-covered seas with leads, polynyas, open water areas, or thin ice that the whales can break through to breathe. Although Arctic coastal peoples have hunted bowheads for thousands of years, historical effects of climate changes and sea ice dynamics on the distribution of bowheads and the efficacy of subsistence harvest practices are not certain. It has been postulated that a cold period 500 years ago resulted in less ice-free water near Greenland, forcing bowheads to abandon the range, and that this led to the disappearance of the Thule culture (McGhee 1984; Aagaard and Carmack 1994; as cited in Tynan and DeMaster 1997). Inversely, it is possible that larger expanses and longer periods of ice-free water would be beneficial to bowhead populations and subsistence harvest practices (e.g., Robards et al. 2017). While large changes to the timing of the bowhead whale spring migration are not expected, the increased open-water period will likely result in delayed arrival to wintering areas in the Bering Sea (Druckenmiller et al. 2017). These changes have also affected many terrestrial, freshwater and marine species that have shifted their geographic ranges, seasonal activities, migration patterns, abundances and species interactions in response to ongoing climate change (IPCC 2014).

4.6.2.2 Reasonably Foreseeable Future Effects of Climate Change in the Project Area

Atmosphere-ocean global climate models (AOGCMs) driven by different greenhouse-gas emission scenarios are the main tools used to predict future climate conditions in the Arctic (USGS 2011). Climate projections for the next 50–100 years produced by global climate models consistently show a pronounced warming over the Arctic, accelerated sea-ice loss, and continued permafrost degradation (IPCC 2007, 2014; USGS 2011, Richter-Menge et al. 2017). Of all areas on Earth, the Arctic has the greatest sensitivity to changes in greenhouse gases, primarily due to albedo-temperature feedback. The ability of Arctic regions to absorb heat energy from solar radiation increases as reflective snow and ice cover declines. As the extent and duration of snow and ice cover declines, a positive feedback loop is established whereby the resulting temperature increases further exacerbate declines in snow and ice cover, which, in turn, further exacerbates temperature increases. Within the Arctic, some of the largest changes are expected to occur in the Bering, Beaufort, and Chukchi seas (Chapman and Walsh 2007; Walsh 2008). Projected climate changes will likely result in selection pressures that could lead to considerable changes in the structure and function of biological systems in the EIS project area.

Given the projections of warming in the Arctic, it is plausible that the Arctic Ocean will become largely ice-free during the summer in the near future. Recent model projections suggest as much as a 60-day reduction in sea-ice duration by the middle of the 21st century (Wang et al. 2017). Overland et al. (2018) note that “model projections show that future temperatures in the Chukchi and Beaufort seas continue to warm at a rate greater than the global rate, reaching a change of +4°C by 2040 relative to the 1981–2010 mean. Offshore at 74°N, climate models project the open water duration season to increase from a current average of three months to five months by 2040.” Sea surface temperature anomalies in the North Pacific have been show to enhance these rates. Additionally, temperature increases may compromise the integrity of ice cellars traditionally used to store subsistence foods after they are harvested, an effect that has already been reported by subsistence users in northern and western Alaska. Overland et al. (2018)

concluded, "…the ecological and societal consequences of such changes show a radical departure from the current Arctic environment."

Climate change effects are difficult to predict, as are the effects of climate-driven changes on bowheads. Bowhead movement patterns and behavior may change relative to changes in sea ice distribution and zooplankton populations. The effects of climate changes will also depend on the ability of bowheads to locate sufficient concentrations of planktonic crustaceans to allow efficient foraging (Druckenmiller et al. 2017). Since phytoplankton blooms may occur earlier or at different times of the season, or in different locations, the timing of zooplankton availability may also change from past patterns (Arrigo and van Dijken 2004, Ardyna et al. 2014). Hence, the ability of bowheads to use these food sources may depend on their flexibility to adjust the timing of their own movements and to find food sources in different places (Druckenmiller et al. 2017).

While the retreat of sea ice due to climate change may enable bowheads to expand their range, it may also increase predator pressure as killer whales expand their range into increasingly ice-free waters. Human sources of disturbance could serve to inhibit the use of some areas by bowheads, The potential for increased commercial shipping and other vessel activity in the Arctic with continued sea ice retreat and longer ice-free periods could contribute to noise disturbance effects on bowhead whales and an increased incidence of vessel avoidance behaviors. Whether this will add markedly to the overall level of disturbance noted above is uncertain.

The effects of climate change on subsistence harvest of bowheads are uncertain (ACIA 2004; Moore and Huntington 2008). There will be more open water and longer ice-free seasons in the arctic seas, which may allow bowheads to expand their range offshore as the population continues to recover from commercial whaling and as ice-free waters to the north become increasingly available. If changes in the abundance and distribution of ice result in bowhead migration occurring further offshore, safe access to whales by subsistence hunters may be reduced. Changes in the migration routes of the whales can affect the ability of whaling communities to hunt successfully.

Subsistence hunters in the project area have already noted such changes:

> *We realize the ecosystem we are in is very healthy and productive. However, the access, due to changing patterns in ice and weather, has affected our ability to access resources. The changes aren't all bad, because in 1990 Savoonga and Gambell started harvesting bowheads in the dead of winter. Consequently, 40 percent of our harvests are now occurring in winter (November/December timeframe). We have begun to take steps to conduct spring whaling activities earlier so we can adjust to the changes that are now occurring in migration patterns of marine mammals, specifically the bowhead whales. –*

George Noongwook, AEWC Vice Chair and representing Savoonga/St Lawrence March 2011 - Open Water Meeting, Anchorage, AK.

In addition, changes in ice conditions have influenced the spring bowhead hunt in communities along the Chukchi Sea coast. Due to dynamic ice conditions that are considered too dangerous and difficult for captains and their crews during the spring season, whaling crews from Wainwright, Point Hope and Point Lay have recently been conducting fall hunts to provide for their communities (Comstock 2011). Since the early 2000's, bowheads have been feeding more frequently in ice-free waters northeast of Utqiaġvik (Barrow), leading to increased hunting success for Utqiaġvik (Barrow) crews in the fall (Treacy 2002; Bodenhorn 2003 as cited in Moore and Laidre 2006; Ashjian et al. 2010). This observed pattern of new feeding patterns for bowheads comports with models predicting increases in prey availability for bowheads driven by the retreat of the ice edge relative to the underwater shelf break, which facilitates wind-driven upwelling of zooplankton-rich waters, as well as greater primary productivity in ice-free waters (Moore and Laidre 2006). Evidence suggests that bowhead whales feed on concentrations of zooplankton throughout their range. Likely or confirmed feeding areas include Amundsen Gulf; Utqiaġvik (Barrow); Wrangel Island; the coast of Chukotka, between Wrangel Island and the Bering Strait; the western Bering Sea; and the Alaskan Beaufort Sea (Quakenbush et al. 2010a,b; Lowry et al. 2004; Clarke and Ferguson 2010a; Ashjian et al.,2010; Okkonen et al. 2011, Shelden et al. 2017). Bowheads have also been observed feeding during the summer in the northeastern Chukchi Sea (Clarke and Ferguson 2010b). Another indication of bowhead whale responses to decreased sea ice is the steady population increase during roughly two decades of sea-ice loss in the western Beaufort Sea (Givens et al. 2016; Figure 3.2.1-1). the bowhead population trend suggests that sea-ice loss is not currently hindering recovery, however, sea ice loss has also opened the Arctic to potential competitors and predators such as humpback whales, fin whales, and killer whales (Clarke et al. 2015, Crance et al. 2015, Moore 2016), as well as bowhead whales from other stocks (Heide-Jørgensen et al. 2012).

4.6.3 Effects of Vessel and Aircraft Traffic in the Project Area

Bowheads may be affected by vessel and aircraft traffic due primarily to acoustic impacts and vessel strikes. The majority of vessel traffic within the proposed action area is in support of international commercial shipping, oil and gas development, and operations at the Red Dog mine. Other vessel activity within bowhead habitat derives from commercial fishing, barges and cargo vessels used to supply coastal villages, smaller vessels used for hunting and local transportation during the open water period, military vessels, research vessels, commercial recreational vessels (e.g., cruise ships), a few private recreational watercraft, and ice breakers used in support of any of these activities. Aircraft use in the area includes commercial aviation transport, private personnel transport (e.g., within oil fields), small fixed wing aircraft, and helicopters in support of oil and gas development, other natural resource development, and natural resource management and research. Military aircraft also use this area. Impacts to bowhead whales may occur from noise due to vessel and aircraft operations, and from vessel strikes.

4.6.3.1 Past and Present Effects of Vessel and Aircraft Traffic in the Project Area

The Northern Sea Route, predominately along the northern coast of Russia, linking Europe, North America, and Asia is being used with increasing frequency by cargo ships and fuel tankers. Between 2015 and 2025, use of this route is projected to increase five-fold (Azzara et al. 2015). In addition, new classes of vessels are using the Northern Sea Route, with some ice hardened vessels with a beam of 50 m and draft of 11.8 m capable of operating in frigid temperatures and travelling through ice up to 2.1 m thick (Gosnell, 2018). Bowhead whales may be affected by vessel-produced noise, ship strikes, and commercial fishing gear interactions.

Vessel Noise. Underwater noise from ships may temporarily disturb or mask communication of marine mammals. Shipping sounds are often at source levels of 150-190 dB re 1 µPa at 1m (BOEM 2011a). Shipping traffic is mostly at frequencies from 20-300 Hz (Greene 1995). Sound produced by smaller boats typically is at a higher frequency, around 300 Hz (Greene 1995). In shallow water, vessels more than 10 km (6.2 mi) away from a receiver generally contribute only to background-sound levels (Greene and Moore 1995). Icebreaking vessels that are used in the Arctic in support of research and oil and gas activities produce louder but also more variable sounds than those associated with other vessels of similar power and size (Greene and Moore 1995). The greatest sound generated during ice-breaking operations is produced by cavitation of the propeller as opposed to the engines or the ice on the hull; extremely variable increases in broadband (10-10,000 Hz) noise levels of 5-10 dB are caused by propeller cavitation (Greene and Moore 1995). Greene and Moore (1995) reported estimated source levels for icebreakers to range from 177-191 dB re 1 µPa-m. Even with rapid attenuation of sound in heavy ice conditions, the elevation in noise levels attributed to icebreaking can be substantial out to at least 5 km (3 mi) (Greene and Moore 1995). In some instances, icebreaking sounds are detectable from more than 50 m (31 mi) away.

Behavioral reactions from vessels can vary depending on the type and speed of the vessel, the spatial relationship between the animal and the vessel, the species, and the behavior of the animal prior to the disturbance from the vessel. Response also varies between individuals of the same species exposed to the same sound. Individual whales' experiences with vessels appear to be important in determining individual whale response to acoustic disturbance and vessel presence (Shell 2011). Vessels moving at slow speeds and avoiding rapid changes in direction or engine RPM may be tolerated by some species and individuals. Others may deflect around vessels and continue on their migratory path. Humpback whale reactions to approaching vessels are variable, ranging from approach to avoidance (Payne 1978, Salden 1993). Whales have been known to tolerate slow-moving vessels within several hundred meters, especially when the vessel is not directed toward the animal and when there are no sudden changes in direction or engine speed (Wartzok et al. 1989, Richardson et al. 1995, Heide-Jorgensen et al. 2003). Animals exposed to vessel noise may exhibit deflection from the noise source, engage in low level avoidance behavior, exhibit short-term vigilance behavior, or experience and respond to short-term acoustic masking behavior, but these behaviors are not likely to result in biologically significant disruption of normal behavioral patterns.

Ship Strikes. Vessel activity may result in mortality of bowhead whales through ship strikes. Increased ship traffic may increase the risk of ships striking bowhead whales. Subsistence harvest data suggests that ship-strike injuries are currently uncommon among bowhead whales in Alaska (George et al., 2017b). Only 10 whales harvested between 1990 and 2012 (~2% of the total sample) showed clear evidence of scarring from ship propeller injuries (see section 3.2.7).

Bowheads that may be killed by ship strikes are not part of the subsistence harvest-derived estimate of bowhead ship strikes, because these individuals are not included in that estimate. Therefore, the subsistence harvest-derived estimate of proportion of bowheads that have been struck by vessels should be considered a minimum estimate. However, given the increasing trend in the Western Arctic bowhead population, the contribution of ship strikes to cumulative effects on bowhead populations is likely to be negligible at the present time. This may change if notable increases in Arctic shipping occur.

Aircraft Noise. Aircraft noise that may affect bowheads is most likely to derive from non-commercial aircraft in the area because these aircraft are more likely to fly at low altitudes over habitat used by bowheads. Helicopters and fixed wing aircraft are used to support routine activities within the EIS project area, and fly over near shore and offshore bowhead habitat. The majority of air travel and freight hauling between Arctic coastal communities involves small commuter-type aircraft, and government agencies and researchers often charter small aircraft for travel and research purposes. Aircraft are also used in support of oil and gas activities and scientific research. These activities are expected to continue, and the level of aircraft traffic within the project area may increase as a result of climate change, research, and/or increased industrial activity and community development.

Aircraft sounds are dominated by tonal harmonics of engine/turbine and blade rates and are largely within the frequency range of cetacean hearing. Due to the reflective properties of the air-water interface on sound, transmission of aircraft noise to the water column is generally limited to a 13^{o} cone beneath the aircraft, although surface roughness of the water can affect the size of this sound transmission cone. The level of aircraft noise reaching the sea surface and transmitting into the water depends on the acoustic source level, atmospheric sound transmission characteristics, and flight altitude. In some cases, the combination of audible and visual (aircraft and shadow) stimuli may produce higher levels of response than would the noise alone (Richardson et al., 1995a), although visual stimuli of aircraft on Bowheads is expected to be negligible. Because aircraft travel at high speeds, and transmission into the water column is limited to a narrow cone beneath the aircraft, the duration of aircraft noise events is on the order of a few seconds to a few tens of seconds (Patenaude et al., 2002). For example, an aircraft travelling at an altitude of 500 feet at 120 miles per hour will transmit sound to a point within its sound transmission cone for less than 1.5 seconds. However, aircraft involved in certain duties may hover, circle, or remain in limited areas, and thereby produce more prolonged noise exposures to marine mammals than would straight-line flight paths.

Underwater sound levels produced by aircraft have been measured by several researchers. Patenaude et al. (2002) report measurements of sound levels and responses of belugas and bowheads to noise from a Bell 212 helicopter and de Havilland Twin Otter fixed-wing aircraft from four seasons of research. Both of these aircraft types are likely to be used for personnel transfers and/or research purposes within the EIS project area. The measurements summarized by Patenaude et al. (2002) were made in springtime during bowhead and beluga migration periods in 34 meter (m) and 170 m water depths, with hydrophones at 3 m and 18 m depths below surface. Various aircraft flight altitudes and airspeeds were monitored. The primary results of the sound level measurements are presented in **Figure 4.6.3-1**. These results indicate that the Bell 212 helicopter noise levels are on average higher than the Twin Otter levels, but the Twin Otter levels reach similar maxima for the same overflight altitudes. The helicopter levels reached 125 dB re 1 µPa SPL at the lowest overflight altitude of 80 m. The Twin Otter levels reached 120 dB re 1 µPa at 150 m flight altitude. Above 400 m altitude, both aircraft produced underwater SPL below 115 dB re 1 µPa.

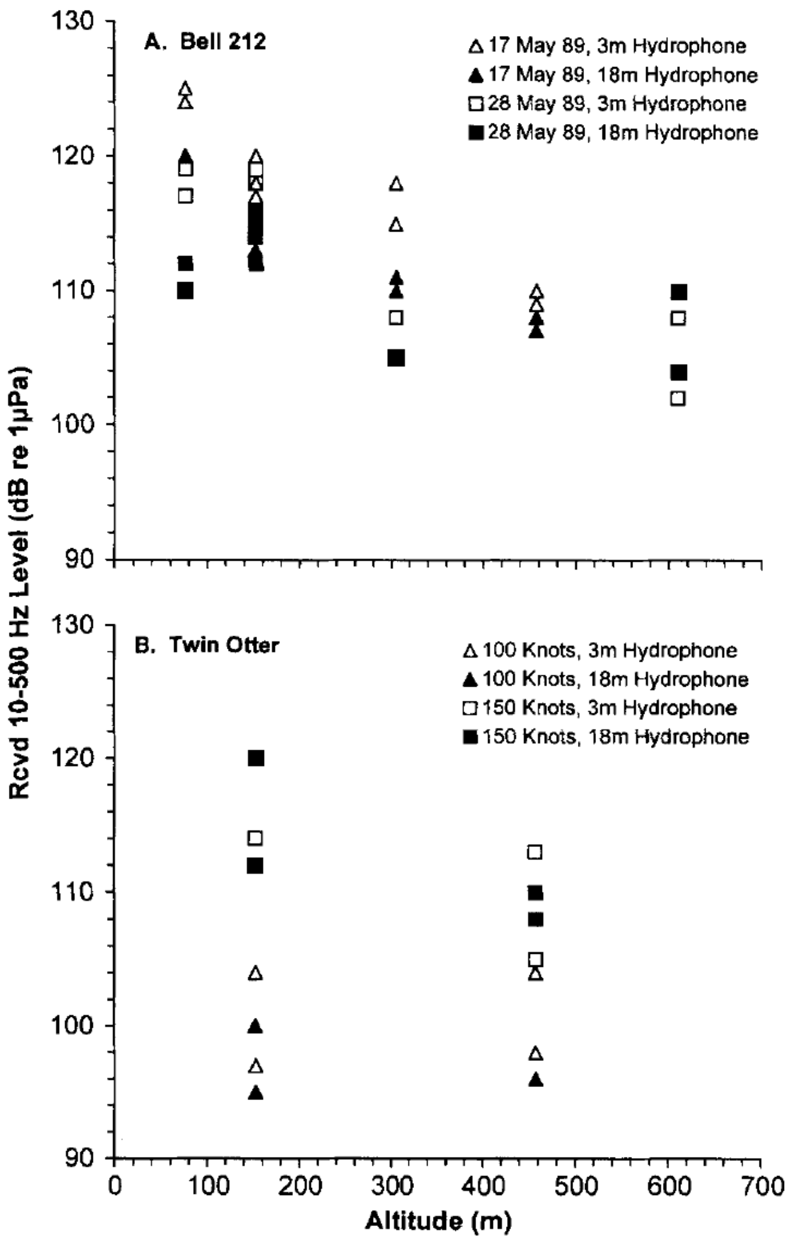

Figure 4.6.3-1. Received levels of underwater sound from (A) Bell 212 helicopter and (B) Twin Otter fixed-wing aircraft flying directly overhead vs. aircraft altitude, hydrophone depth, and (for Twin Otter) airspeed. Open and filled symbols show paired measurements at 3 m and 18 m hydrophone depths, respectively. Bandwidth 10-500 Hz; averaging time 0.75 sec. Source: Patenaude et al., 2002.

Corresponding observations of marine mammal reactions were made by biologists aboard the aircraft or on ice. **Table 4.6.3-1** summarizes the results of these observations in terms of percentage of groups that reacted for overflights below and above threshold altitudes (150 m for the Bell 212 and 182 m for the Twin Otter), and within or beyond a lateral distance threshold of

250 m.

Table 4.6.3-1

Percentage occurrence of observed reactions by spring-migrating bowhead and beluga whales to helicopter and fixed-wing aircraft, overall and by aircraft altitude and lateral distance

	Percent of groups seen to react						
		Altitude			Lateral distance		
	Overall	≤150 m	>150 m	P	≤250 m	>250 m	P
Bell 212 helicopter							
Bowhead							
Heli. flying	15	15[b]	13[c]	0.66	24	10[d]	0.17
Heli. on ice	13[c]				–	0[c]	–
Beluga							
Heli. flying	31	40[b]	10[c]	0.12[e]	53	0[c]	0.004
Heli. on ice	50[c]				42[c]	–	–
Twin Otter Fixed-Wing							
Bowhead	2.2	3.7[b]	1.0	0.063	Infrequent	Rare	–
Beluga	3.2	5.4[b]	1.4	0.009	Infrequent	Rare	–

Source: Table 6 in **Patenaude et al. (2002)**.

a "–" means n <7.

b Probably an underestimate because of brevity of observations, especially for Twin Otter.

c Percentages based on 7-14 groups of whales (otherwise >14).

d Probably an overestimate

e Statistical power low

f Not calculable because lateral distances from Twin Otter were not recorded for some groups that did not react.

The findings of Patenaude et al. (2002), as summarized in Table 4.6.3-1, suggest that approximately 15percent of bowheads reacted to helicopter overflights. Based on the Bell 212 sound measurements of Figure 4.6.3-1, these whales were likely exposed to maximum helicopter noise levels between 110 and 125 dB re 1 µPa. Fewer reactions occurred for flight paths beyond 250 m lateral range from the whales, but the number of observations was not high enough to confirm significance of that difference. Beluga reactions to the helicopter were greater, with approximately 31percent of animals reacting. There were significantly fewer (zero) reactions observed at lateral distances greater than 250 m from the flight path.

The fixed wing Twin Otter aircraft produced smaller percentages of observable reactions by both bowheads and belugas than did the helicopter, even though the sound measurements indicate that the Bell 212 noise levels were not substantially greater. The Twin Otter sounds have lower broadband non-tonal noise than the Bell 212, and that could be a possible reason for reduced reactions, although this is largely conjecture. For both aircraft, the reactions consisted of abrupt dives, tail slapping, breaching, turns, and unusually brief surfacing. No long-term reactions were noted, and the overall impact of these temporary behavior modifications is likely to be minor.

In summary, vessel and aircraft noise have the potential to cause behavioral disruption of bowheads, but these disruptions are not expected to result in significant disruptions to behavioral patterns.

4.6.3.2 Reasonably Foreseeable Future Effects of Vessel and Aircraft Traffic in the Project Area

Changes in the distribution of sea ice, longer open-water periods, and increasing interest in studying and viewing Arctic wildlife and habitats may support increases in vessel traffic in the proposed action area, regardless of oil and gas activity (AMSA, 2009). To help manage this projected increase in shipping traffic (**Fig 3.2.7-1**), the United States and Russian Federation have proposed a system of voluntary two-way routes for all domestic and international ships to follow in the Bering Strait and Bering Sea (IMO 2017) (**Fig 3.2.7-2**).

Increased vessel traffic in the Beaufort and Chukchi Seas may result in greater incidents of pollutant discharges, and an increase in the risk of disturbance effects such as ship noise and ship strikes on migrating and foraging bowheads (AMSA, 2009). Observed and predicted decreases in the summer extent of the ice pack could also lead to a substantial increase in commercial shipping in the Arctic, especially if the Northwest Passage becomes reliably navigable (ACIA, 2004). Vessel traffic through the Bering Strait has risen steadily over recent years according to U. S. Coast Guard (USCG) estimates, and Russian efforts to promote a Northern Seas Route for shipping may lead to continued increases in vessel traffic adjacent to the western portion of the EIS project area. The Northern Seas Route has become an opportunity for Russia and China to bring services and commodities transported on large vessels escorted by icebreakers (including petroleum products via ice strengthened super tankers) to Asian markets (Whitney, 2012). Development of new classes of vessels may render the need for icebreaker accompaniment obsolete. Increased ship traffic may also be associated with offshore seismic exploration and exploratory drilling for oil and gas. Potential offshore development in the Beaufort and Chukchi seas would increase the numbers of support and supply ships transiting the region. The service vessels to support offshore oil and gas exploration activities can be categorized as supply, crew, and utility vessels (seismic and icebreaking). Exploratory drilling programs would be expected to use several support vessels, including spill response vessels and vessels for ice management. In 2012, Shell Oil Co. launched a 360-foot tug supply vessel the M/V Aiviq, which is an anchorhandling icebreaker. This vessel is classified as a Polar Class 3 ship that according to international shipping standards will allow it to operate year round in second year ice.

The western Arctic stock of bowhead whales seasonally migrates through the Bering Strait, Chukchi and Beaufort seas. In the Bering Strait, bowheads are constrained to a relatively small corridor, exposing them to increased interactions with vessels transiting this area. Bowhead whale migration could be affected by icebreakers operating in this area. Whales could move further offshore following the open leads created by icebreaking vessels, possibly putting them out of reach of coastal whaling communities (AMSA, 2009).

It is highly plausible there would be greater marine access and longer seasons of navigation, but not necessarily easier ice conditions for marine operations (AMSA, 2009). Increased vessel traffic in the Beaufort and Chukchi seas may interact additively or synergistically with other stressors such as climate change and seismic exploration, affecting foraging bowheads and their prey, or increasing the incidence of ship strikes. Most severe and lethal ship strikes of whales involve relatively large ships (e.g., 80 m or longer) traveling at speeds of 14 knots or faster (Laist et al., 2001). Because the probability of a vessel striking a whale increases as the speed of the vessel increases, it follows that the hazard posed by ships is at least partly a function of their speed (Laist et al. 2001; Vanderlaan and Taggart, 2007). Thus, management actions may focus on reducing vessel speeds to below 14 knots in areas where cetaceans are known to occur. As climate and sea ice conditions continue to change, the timing and location of bowhead activity may also change, making predictions of the potential interactions between shipping and bowheads increasingly complex (AMSA, 2009).

4.6.4 Effects of Commercial Fishing in the Project Area

Bowheads may interact with commercial fishing operations. Most commercial fishing activity in the Bering Sea occurs south of the range of bowhead whales. Citta et al. (2014) found that the distribution of satellite-tagged bowhead whales in the Bering Sea overlapped spatially, but not temporally, with some areas where commercial pot fisheries occurred, noting the potential risk of whales becoming entangled in derelict gear.

4.6.4.1 Past and Present Effects of Commercial Fishing in the Project Area

The North Pacific Groundfish Observer Program places observers on many of the large commercial fishing vessels that operate in the northern Bering Sea, but there are no observer records of fishery interactions with bowheads either through entanglements in fishing gear or ship strikes (Angliss and Outlaw, 2005). There are also no self-reported interactions from vessels without observers. However, based on multi-year photo mark-recapture data and other data from subsistence-harvested bowheads, the probability of a bowhead acquiring an entanglement injury was estimated at 2.4% per year (Givens et al. 2017, IWC SC/67a 2017 page 63). About 50% of large (≥17m) subsistence-harvested bowheads bore entanglement scars (George et al. 2017). Most entanglement injuries occurred on the peduncle and were rarely observed on smaller subadult and juvenile whales (<10 m). These estimates of entanglement, primarily with derelict commercial pot-fishing gear, should be considered minimum estimates of entanglement rates, as they do not include those whales that may have become anchored in place by pot gear, or that died because of entanglement and were not among the animals available for subsistence harvest.

Other interactions with bowhead whales and commercial fisheries are not expected in U.S. waters. To date, no large commercial fisheries have developed in the U.S. Beaufort and Chukchi Seas, and no commercial fishing occurs in the U.S. Arctic except for several small fisheries that occur in state waters managed by the State of Alaska. These include a small commercial set net fishery for chum salmon in the Kotzebue Sound region, and a very small commercial fishery for whitefish in the delta waters of the Colville River (NPFMC, 2009). These commercial fisheries in the Beaufort and Chukchi seas are expected to make negligible contributions to cumulative impacts on bowhead whale populations due to the timing, locations, and limited spatial extent of fishery activities.

4.6.4.2 Reasonably Foreseeable Future Effects of Commercial Fishing in the Project Area

The Arctic Management Area, including all marine waters in the U.S. EEZ of the Chukchi and Beaufort seas north of the Bering Strait from 3 nautical miles offshore the coast of Alaska or its baseline to 200 nautical miles offshore, is closed to commercial fishing until such time in the future that sufficient information is available with which to initiate a planning process for commercial fishery development (NPFMC, 2009). However, considering warming trends in ocean temperatures and changes in seasonal sea ice conditions, it is conceivable that the Alaska Arctic EEZ could offer commercial fishing opportunities in the future (Newton, 2005). Longer ice-free seasons coupled with warming waters and fish range expansion could together create conditions that lead to commercial fishery development. Although several species of finfish and shellfish occur in these waters that may support future commercial fisheries, there are no such fisheries in the U.S. Arctic Management Area at this time (NPFMC, 2009). Commercial fishing activities in the Bering Sea, as well as several small fisheries that occur solely in state waters, are likely to continue in the future, but potential changes in fishing effort relative to the range of the bowhead are unknown. The North Pacific Fishery Management Council established the Northern Bering Sea Research Area (NBSRA) in 2008 and prohibited bottom trawling in the northern part of the Bering Sea. This area includes nearly all of the Bering Sea waters north of 61^{o} N Latitude. Bottom trawling within U.S waters has little spatial overlap with the range of bowheads, and northern extension of bottom trawling effort further north into the bowheads' range is not expected in the foreseeable future. In addition, interactions between bottom trawling and bowheads have not been reported.

Some commercially exploited fish stocks may expand in both abundance and range as a result of climate warming while other stocks are predicted to decline (ACIA, 2004). However, due to the North Pacific Fishery Management Council moratorium on commercial fishing in the Arctic Management Area, and the prohibition of bottom trawling in the Northern Bering Sea Research Area, the potential contribution of commercial fishing to cumulative impacts within the range of the bowhead is likely to remain small. The notable exception to this is the effects of derelict pot fishing gear on entanglement rates of bowhead whales. Barring regulatory action from NOAA, which would require additional analysis of impacts to bowhead whales and subsistence harvest practices, substantial changes in commercial fishing effort in the FEIS project area are unlikely to occur in the foreseeable future. Likewise, entanglement rates caused by derelict fishing gear is unlikely to change barring changes to how northern Bering Sea pot fisheries are conducted.

4.6.5 Effects of Research Activities in the Project Area

Research activities occurring in the project area have the potential to affect bowhead whales, both incidentally and intentionally. Considerable scientific research effort conducted by government, industry, and educational organizations occurs every year in the EIS project area.

4.6.5.1 Past and Present Effects of Research Activities in the Project Area

The programs conducted by government, industry, and educational organizations have generally included marine environmental baseline studies, deployment of oceanographic equipment for collecting water and sediment samples, and use of nets and trawls for collection of phytoplankton, zooplankton, benthic and pelagic invertebrates, and fish. Moorings, buoys, and acoustic wave and current meters are also deployed for studies of physical oceanography and climate.

The Western Arctic Shelf Basin Interactions (SBI) project was a 10-year (1999-2009) interdisciplinary program investigating the impacts of climate change on biological, physical, and geological processes in the Western Arctic Ocean (Grebmeier et al. 2009). Funded by the National Science Foundation (NSF) and Office of Naval Research (ONR), the project was conducted from the U.S. Coast Guard HEALY and POLAR STAR icebreakers. Underwater noise generated by icebreakers may be a substantial source of impact within the EIS project area. Although radiated noise levels for these ships have not been measured, estimated source levels for icebreakers of similar size range from 177-191 dB re 1 μPa at 1 m (Richardson et al., 1995a: Table 6.5). Increases in noise level (197dB to 201dB) during ice breaking are caused by propeller cavitation, are broadband (10- 10,000 Hz), and are extremely variable over the period of pushing ice. Noise from research activities aboard the icebreakers or from ice camps may also be audible underwater, but source levels from these activities would be expected to be much lower than that of a ship breaking ice. It should be noted that ambient sea-ice noise is also extremely variable, with source levels of 124-137 dB re 1 μPa at 1 m for 4 and 8 Hz tones measured for ice deformation noises at pressure ridges (Richardson et al., 1995a).

Based on previous studies of bowhead response to noise, ice-breaking noise could result in temporary displacement of whales from the area where the icebreakers were operating and could potentially cause temporary deflection of the migration corridor (see Section 4.6.1 for further discussion of noise disturbance).

Research specifically on bowhead whales has been conducted since the early 1980s. The early focus of research was to understand the species' biology and ecology, particularly abundance, distribution, and habitat use (e.g., Burns et al. 1993). The Bureau of Ocean Energy Management (BOEM), collaborating with NOAA, NSF, ONR, USFWS, NSB, NPRB, ADF&G and others, has partially or fully funded research focused on population growth, habitat use, genetics, body condition, and response to anthropogenic sources, particularly because bowheads use habitat near oil and gas developments (e.g., Citta et al. 2015, Kuletz et al. 2015, Clark et al. 2015, George et al. 2015, Citta et al. 2017, Shelden et al. 2017, see also Chapter 3). An ecosystem approach to studying habitats occupied by high Arctic species has resulted in several special issues of peer-reviewed journals describing physical, chemical, and biological characteristics of bowhead whale habitat (e.g., Dunton et al. 2014, Moore and Stabeno 2015, Dunton et al. 2017, Mueter et al. 2017).These types of studies include research platforms on land, small to large vessels, moorings, and aircraft (both manned and unmanned). Depending on the project, bowhead whales could be temporarily deflected from feeding and migratory areas due noise or close approaches. Researchers work closely with the Native communities to ensure sampling and survey methods will have minimal, if any, effects on species used for subsistence (e.g., Konar et al. 2017, Robards et al. 2018).

4.6.5.2 Reasonably Foreseeable Future Effects of Research Activities in the Project Area

Research activities similar to those discussed above are expected to continue for the reasonably foreseeable future (e.g., SOAR Phase II: https://www.pmel.noaa.gov/soar/soar-phase-2). Increased noise from vessel and aerial surveys may result in temporary disturbance and temporary displacement of whales, or temporary deflection of bowhead migration. However, there is presently no evidence to indicate that current noise levels result in long-term adverse behavioral or physiological effects on the Western Arctic bowhead stock. Continued cooperation with Native communities of the North Slope will be essential to minimize disturbance during the hunting seasons.

4.6.6 Effects of Other Development in the Project Area

Other activities that may possibly contribute to the cumulative effects on bowhead whales include military activities, other industrial development, and tourism.

4.6.6.1 Past and Present Effects of Other Development in the Project Area

Military Activities. Prior to 2013, the surface and airspace of the Chukchi and Beaufort seas were not extensively used for testing or training of military aircraft, vessels, weapon systems, and personnel. Historically, military vessels or aircraft have not been stationed in the Beaufort or Chukchi seas. As of 2018, none of the airspace over the Beaufort and Chukchi seas is classified as ‘special use airspace’ for the military by the Federal Aviation Administration (https://sua.faa.gov/sua/siteFrame.app). However, shortly after the National Strategy for the Arctic was released, the Department of Defense released its 2013 Arctic Strategy that identified its objectives to ensure security, support safety, and promote defense cooperation and to prepare for a wide range of challenges and contingencies. This strategy was updated in 2016 to sharpen its focus on homeland defense in light of changes to the international security environment. To supplement the national-level guidance, the Navy released its Arctic strategy in a document called the Arctic Roadmap (Kendall 2014). The Arctic Roadmap identifies four strategic objectives:

- Ensuring sovereignty of the United States’ Arctic region;
- Providing ready naval forces to respond to crises and contingencies;
- Preserving freedom of navigation; and
- Promoting partnerships within the U.S. government and with its international allies and partners.

The U.S. Navy regularly and routinely operates and conducts undersea and on-ice exercises in the Arctic Ocean, and collaborates and cooperates with other Arctic nations by participating in multinational exercises, including Ice Exercises “ICEX” held every two years (https://en.wikipedia.org/wiki/ICEX:_US_Navy_Mission_in_Arctic). Submarines are often used for oceanic research or military activities in the area, particularly for use of passive and active acoustic technologies. Information about the response of bowhead whales to submarines is not available. Passive acoustics would not introduce noise to the environment and would likely result in no impact to bowhead whales.

Past military activities in the area were associated with the Distant Early Warning system, an integrated chain of radar and communications sites across Alaska, northern Canada, and Greenland. This system was discontinued in 1963 and replaced with short- and long-range radar (https://en.wikipedia.org/wiki/North_Warning_System). As of 2018, only three stations in Alaska remain active: Barrow, Oliktok, and Barter Island, along the north coast (western Beaufort Sea). The U.S. Department of Defense is in the process of dismantling the abandoned sites.

Beginning in 2009, during the open water months, Operation Arctic Crossroads has been conducted in an effort to integrate local knowledge of the region with military expertise to meet the challenges of Arctic operations. This operation involves USCG, U.S. Air Force, Army National Guard, Air National Guard, and U.S. Public Health Services personnel. This program aims to build Arctic domain awareness, involves USCG cutter operations (including icebreaking, buoy tenders and cutters), deployments to villages, community engagement, and search and rescue exercises. The USCG cutter Hamilton entered Arctic waters for the first time in 2009 to conduct search and rescue drills. Use of cutters in the Arctic is a challenge as the hulls of these vessels are not ice reinforced. The USCG had indicated that the current infrastructure and small boats and short range helicopters was not effective for long distance search and rescue operations in the Arctic and limit response capabilities for emergencies and response to potential oil spills. In 2017, the USCG through the programs Arctic Shield and Operation Arctic Guardian increased its presence in the Arctic, conducting oil spill response drills and training, outreach at multiple Native communities, search and rescue operations, and transiting the Northwest Passage with the first non-icebreaking cutter since 1967 (USCG 2017, http://www.pacificarea.uscg.mil/Our-Organization/District-17/Arctic-Shield/)

Other Industrial Development. On the Chukchi Sea, the major industrial developments are associated with the Red Dog Mine and Delong Mountain Terminal. Red Dog Mine is the largest producer of zinc concentrate in the world. Mining operations have reserves for over 40 years. The Delong Mountain Terminal receives ore concentrate from the Red Dog Mine and stores it until the area is free of ice. Approximately 250 barge trips per year transfer 1.5 million tons of concentrate to about 27 bulk cargo ships, which are anchored 9.7 km (6 mi.) offshore (MMS, 2006b).

Tourism. Tourism activities have typically been concentrated, on land but lack of sea ice has opened areas to marine vessels (such as small cruise ships). The U.S. Coast Guard District 17 (Alaska) noted 485 Bering Strait transits in 2016, down slightly from 540 in 2015, but up significantly from 220 transits in 2008. Vessel traffic includes merchant vessels such as cargo ships, tankers, bulk carriers, and tugs, but also research vessels, cruise ships, and even private adventurers on sailing and motor vessels. In 2016 there were 290 vessels that passed within the District 17 Arctic Area of Interest (extending northward from the Bering Strait to the North Pole), a massive rise from the 120 vessels noted in 2008 (Gosnell 2018).

The effects of vessels are related to ship strikes and anthropogenic noise. The effects of ship strikes are discussed in Section 4.6.3 and the effects of anthropogenic noise on bowheads are discussed in Section 4.6.1.

4.6.6.2 Reasonably Foreseeable Future Effects of Other Development in the Project Area

Military Activities. Military activity in the Arctic has increased in recent years, and it is reasonable to expect that military activity will continue to increase in the foreseeable future. Military activities in the proposed action area include the transit of military vessels through area waters, as well as submarine activity, aircraft overflights, icebreaking activity, and related maneuvers. In routine operations, submarines use passive sonar, which is not likely to disturb bowhead whales. The use of submarines as research platforms is likely to continue, resulting in potential disturbance to bowheads.

Other Industrial Development. Future development associated with the Red Dog Mine facility includes onshore developments, such as roads and/or infrastructure, which would have no impact on bowhead whales. The Red Dog Mine port site could also become the port facility for expanded mining operations for metallic minerals and/or coal in Northwest Alaska. However, a major expansion of the Red Dog Port and/or Delong Mountain Terminal would involve substantial capital expense, and such an expansion does not appear economically viable. The Red Dog Mine will continue to depend on marine transport systems, and it is plausible that the summer, ice-free season for support to the Red Dog Mine could be extended as Arctic sea ice continues to retreat in the Chukchi Sea (AMSA, 2009). Current projections are that the Red Dog Mine will remain in operation until 2030 (SRK 2016). In addition, coal mining prospecting proposals for the Brooks Range have been submitted to Alaska Department of Natural Resources, Division of Mining, Land and Water for approval. Past, present and reasonably foreseeable future activities related to mining are summarized in **Table 4.6.6-1**.

Table 4.6.6-1
Past, Present, and Reasonably Foreseeable Future Actions Related to Mining in the Project Area

Category	Area	Action / Project	Past	Present	Future
Mining	Red Dog Mine	Zinc Mine	X	X	X
	Red Dog Port	Minerals Export	X	X	X
		Coal Export			X
	Brooks Range	Coal Mining			X

Also associated with industrial development are chemical contaminants, Chemical contaminants are introduced to Arctic ecosystems through a variety of endogenic and exogenic sources. Certain organic pollutants tend to accumulate and persist in cold climates due to decreased mobility and slower degradation rates at lower temperatures. Organic pollutants and other contaminants, such as heavy metals, may be deposited in Arctic environments as a result of both long-range transport processes and local activities. The deposition and accumulation of contaminants are expected to continue over the reasonably foreseeable future, and must be considered in combination with actions that may lead to cumulative impacts in the proposed action area.

Tourism. Tourism activities are also likely to increase in the area, resulting in potential ship strikes and increased noise. The effects of ship strikes are discussed in **Section 4.6.3** and the anthropogenic noise on bowheads are discussed in **Section 4.6.1**.

4.7 Cumulative Effects of the Alternatives and Other Activities in the Project Area on the Western Arctic Bowhead Whale Stock

The intent of this section is to assess the contribution of the alternatives to the overall cumulative effects of other activities in the project area on bowheads. See **Table 4.11-1** for a summary of the direct, indirect, and cumulative effects of the alternatives and other activities on the Western Arctic bowhead whale stock.

It is important to frame this section by describing the status of the Western Arctic stock of bowhead whales. The Western Arctic stock bowhead whales currently appears resilient to the level of human- caused mortality and disturbance that has occurred within its range since commercial whaling ended. Since bowhead whales can live over 100 years (George et al., 1999), many individuals in this population have likely been exposed to numerous disturbance events during their lifetimes. Despite that exposure, this stock of bowhead whales has been steadily increasing at an estimated 3.4% per year (George et al., 2004a) and may even be approaching carrying capacity (Brandon and Wade, 2006). There is currently no indication that the combined effects of past or present noise and disturbance-causing factors or mortality levels since commercial whaling ended are hindering population growth.

Offshore Oil and Gas Activities. As described above, offshore petroleum exploration and development, shipping, aircraft, and research activities all contribute marine noise and activities that may disturb bowheads to the point of altering their movement patterns and behavior. These activities take place across the range of the Western Arctic stock of bowheads and are likely to continue or to expand in the future. Long-term and localized sources of noise, such as offshore petroleum facilities, can be regulated to mitigate the effects on bowheads during the times when they are present, but nonetheless may lead to bowheads avoiding those areas, resulting in loss of available habitat. Mobile sources of noise such as marine vessels tend to be short-term and inconsistent in time and place. Whales may avoid these sources when they encounter them, but are not likely to abandon a particular area of their range unless the disturbance is more consistent and prolonged.

The cumulative effects of the alternatives and offshore oil and gas activities, with the exception of the possibility of a very large oil spill (VLOS), would be minor. Alternative 1 would contribute no mortality and disturbance to the cumulative effects on bowheads, so the cumulative effects of human activities other than subsistence whaling are rated negligible to minor, as described in the preceding sections. Alternatives 2, 3, 4, and 5 would make minor contributions to the cumulative effects of disturbance to bowhead populations from all activities in the project area

Oil Spills. The potential effects of a VLOS (**Section 4.6.1.3**) could result in major cumulative effects of disturbance, injury, and mortality. A VLOS is a low probability, high consequence event and the duration of effects from a VLOS on individual bowhead whales could range from temporary (e.g., skin irritations or short-term displacement) to permanent (e.g., endocrine impairment, reduced reproduction, or mortality). Displacement from areas affected by a spill is likely due to response activities. If the area affected were an important feeding area, or along a migratory corridor, the effects might be of higher magnitude. Population level effects are possible if a VLOS coincided with and affected large feeding aggregations of bowhead whales, particularly if calves were present.

Alternative 1 would contribute no mortality and disturbance to the cumulative effects on bowheads, so the cumulative effects of human activities other than subsistence whaling are rated negligible to minor, as described in the preceding sections. A VLOS would influence the context and contribution of Alternatives 2, 3, 4, and 5 to cumulative effects on bowhead whales. If the timing and location of a VLOS resulted in significant injury or mortality, the added contribution of Alternatives 2, 3, 4, and 5 to cumulative effects could result in impact levels at the population level of minor for mortality, and minor to moderate for disturbance.

Climate Change. Also important for assessing cumulative effects on bowhead whales are the current and projected effects due to climate change. Although the current state of knowledge is limited, bowhead whales may be sensitive to current and ongoing effects of climate change in the Arctic. The loss of sea ice may be opening new habitat and the possibility of genetic exchange between Atlantic and Pacific populations that were previously separated by sea ice. Satellite-tagged bowhead whales from both Alaska and West Greenland recently entered the Northwest Passage from opposite directions and spent roughly ten days in the same general area. This is the first documented overlap of these two populations (Heide-Jørgensen et al., 2011). Sea ice loss is also allowing for range expansions of seasonally migrant sub-Arctic and temperate whale species (e.g., fin and humpback whales) into the Beaufort and Chukchi seas (Clarke et al., 2011; Hashagen et al., 2009). Range expansion of these more temperate species could lead to competition for resources with Arctic species, such as bowhead whales (ACIA, 2005).

Alternative 1 would contribute no mortality and disturbance to the cumulative effects on bowheads, so the cumulative effects of human activities other than subsistence whaling are rated negligible to minor, as described in the preceding sections. Although current knowledge on the cumulative effects of climate change on bowhead whales is limited, it is likely that subsistence harvesting under Alternatives 2, 3, 4, and 5 would make only a minor contribution to these cumulative effects.

Vessel and Aircraft Traffic. The majority of vessel traffic within the proposed action area is in support of international commercial shipping, domestic shipping to coastal villages, oil and gas development, and operations at the Red Dog mine. Other vessel activity within bowhead habitat derives from commercial fishing, , smaller vessels used for hunting and local transportation during the open water period, military vessel traffic, vessels conducting scientific research, commercial recreational vessels (e.g., cruise ships) a few private recreational watercraft, and ice breakers used in support of any of these activities. Aircraft use in the area includes commercial aviation transport, private personnel transport (e.g., within oil fields) and small fixed wing and helicopters in support of oil and gas development, other natural resource development, and natural resource management and research. Military aircraft also use this area. Impacts to bowhead whales may occur from noise due to vessel and aircraft operations, and from vessel strikes.

Alternative 1 would contribute no mortality and disturbance to the cumulative effects on bowheads, so the cumulative effects of human activities other than subsistence whaling are rated negligible to minor, as described in the preceding sections. It is likely that subsistence harvesting under Alternatives 2, 3, 4, and 5 would make only a minor contribution to the cumulative effects of vessel and aircraft traffic activities on the bowhead whale stock.

Commercial Fishing. Commercial fishing vessels may strike a small proportion of bowhead whales, with injuries from vessels observed in about two percent of subsistence-harvested bowheads. While the lack of spatio-temporal overlap between commercial fishing vessels and bowheads suggests that vessel noise and ship strikes are not expected to result as a result of fishing, a notable proportion (12 percent) of bowheads bear signs of entanglement with gear, most likely derelict commercial pot gear, with some bowhead mortality having been reported due to entanglement with derelict commercial crab gear. While commercial pot fishing gear remains a threat to individual bowheads, it is unknown whether this is having population-level effects. The continued growth of the bowhead population, however, indicates that commercial fisheries interactions are not precluding the recovery of this endangered species. Nevertheless, the effects of commercial fishing likely have a minor to moderate effect on the bowhead whale population through entanglement in derelict gear.

Alternative 1 would contribute no mortality and disturbance to the cumulative effects on bowheads, so the cumulative effects of human activities other than subsistence whaling are rated negligible to minor, as described in the preceding sections. It is likely that subsistence harvesting under Alternatives 2, 3, 4, and 5 would make only a minor contribution to the cumulative effects of commercial fishing activities on the bowhead whale stock.

Research Activities. Research activities occurring in the project area have the potential to affect bowhead whales, both incidentally and intentionally. Considerable scientific research effort conducted by government, industry, and educational organizations occurs every year in the FEIS project area.

Alternative 1 would contribute no mortality and disturbance to the cumulative effects on bowheads, so the cumulative effects of human activities other than subsistence whaling are rated negligible to minor, as described in the preceding sections. It is likely that subsistence harvesting under Alternatives 2, 3, 4, and 5 would make only a minor contribution to the cumulative effects of research activities on the bowhead whale stock.

Other Development. Other activities that may possibly contribute to the cumulative effects on bowhead whales include military activities, other industrial development, and tourism. Alternative 1 would contribute no mortality and disturbance to the cumulative effects on bowheads, so the cumulative effects of human activities other than subsistence whaling are rated negligible to minor, as described in the preceding sections. It is likely that subsistence harvesting under Alternatives 2, 3, 4, and 5 would make only a minor contribution to the cumulative effects of other development activities on the bowhead whale stock.

In summary, considering the aggregated impacts and interactions of past, present, and reasonably foreseeable future actions, the cumulative effect of disturbance on bowheads is minor in magnitude, since the distribution of the bowhead population is unlikely to be changed. The geographic extent of disturbance effects discussed in this section is primarily localized, but disturbances may occur in numerous locations, particularly with respect to commercial fishing throughout the Bering Sea, for an aggregate rating of moderate. The duration of these effects is primarily short-term, although effects from oil spills, oil spill response and derelict fishing gear can span across years. Therefore, the aggregate rating for the duration of these effects is considered to be moderate. The overall effects of disturbance from sources other than subsistence whaling are unlikely to limit bowhead population growth, because bowheads have continued to show population growth in the presence of these effects. Therefore, we consider these effects to be minor (**Table 4.1-1**).

4.8 Direct and Indirect Effects of the Alternatives on Other Wildlife in the Project Area

Alternative 1 would not provide federal authorization for subsistence whaling. In itself, this would have no direct impact on other wildlife species. However, as an indirect effect, it is likely that hunting pressure on other species (especially seals, walrus, and caribou) would increase substantially to compensate in part for the loss of the whale harvest. Although this increased effort on other species is unlikely to replace the whale harvest, it could lead to moderate and possibly major reductions in the populations of popular subsistence-harvested species around the whaling communities. Hunting pressure on these species might increase a small amount with minor effects on populations. Increased hunting activity would also increase noise and disturbance to subsistence-harvested species and other wildlife. Since the loss of whaling would affect a number of communities, increased hunting disturbance would affect populations of subsistence-harvested species in numerous locations, but not range-wide for any species. For species that often congregate in numbers, like walrus and caribou, disturbance could affect numerous animals for each hunting event and the effects would be considered moderate. For species that are dispersed, like seals and polar bears, few animals would be disturbed and the effects would be considered minor. The duration of effects would depend on the duration of a whaling moratorium but the frequency of disturbance on other wildlife would likely vary from minor to moderate.

Alternatives 2, 3, 4 and 5 are not expected to have more than negligible or minor effects on other wildlife species. Just as individual bowhead whales may be indirectly affected by hunting activities, (e.g., vessel noise) (**Section 4.5**), other wildlife such as seals, polar bears, or other whales may also be disturbed by these activities. For each of the action Alternatives, there is a potential for harassment of North Pacific right whales, including the possibility of inadvertent initial approaches of right whales by whaling crews. As described in NMFS's Biological Opinion, NMFS and the AEWC will continue to work together to reduce potential adverse effects on North Pacific right whales that may occur in bowhead hunting areas, especially near St. Lawrence Island.

Additionally, the Native villages and communities that currently harvest bowhead whales would be likely to alter their harvest patterns of other subsistence foods depending on the number of bowhead whales harvested. This currently occurs, as other species may be sought out when bowheads cannot be hunted due to weather/ice or whenever a village's hunting is only partially successful. At these times, it is possible that subsistence hunters may increase their harvest of other animals, such as seals, ducks, fish, caribou, bears, walrus, beluga whales, Dall sheep, or freshwater and marine fish. It is not possible to quantify this effect, as each subsistence food has its own individual value and place within the Alaska Native diet. A pound of bowhead whale *maktak* is not necessarily replaceable by a pound of caribou or whitefish, even if direct substitution were possible. In magnitude, extent, and duration, these effects are considered negligible to minor.

NMFS completed a consultation under section 7 of the ESA regarding the potential effects of the bowhead subsistence harvests on ESA listed species and designated critical habitat under NMFS jurisdiction. In its November 2018 biological opinion, NMFS reviewed potential impacts to seven species: bowhead whale; North Pacific right whale; fin whale; humpback whale, Western North Pacific Distinct Population Segment (DPS); humpback whale, Mexico DPS; bearded seal; and ringed seal (**Appendix 8.4.2**). NMFS concluded that the proposed action is not likely to jeopardize the continued existence of bowhead whales or North Pacific right whales.[31] NMFS does not expect any effects to designated North Pacific right whale critical habitat, which is located far outside the action area. While the Arctic ringed seal, Beringia DPS bearded seal, Mexico DPS humpback whale, Western North Pacific DPS humpback whale, and fin whale are expected to occur in the action area, NMFS concluded that they are unlikely to be adversely affected by the proposed action.

The U.S. Fish and Wildlife Service (USFWS) was consulted regarding potential effects of the bowhead subsistence harvests on ESA listed species, ESA candidate species, and designated critical habitat under USFWS jurisdiction. In its May 2018 consultation letter, USFWS reviewed potential impacts to three species listed as threatened: Steller’s eider, spectacled eider, and polar bear (see **Appendix 8.4.1**). Potential impacts to designated critical habitat for polar bear and spectacled eider were also reviewed. USFWS concluded that the proposed annual quotas for bowhead subsistence harvests are unlikely to adversely affect listed species or designated critical habitat under USFWS’s jurisdiction.

[31] As described in NMFS’s Biological Opinion, NMFS and the AEWC will continue to work together to reduce potential adverse effects on North Pacific right whales that may occur in bowhead hunting areas, especially near St. Lawrence Island.

4.9 Cumulative Effects of the Alternatives and Other Activities on Other Wildlife in the Project Area

Chapter 3 describes a number of marine and terrestrial wildlife species that are present in the Alaskan coastal areas considered in this FEIS. Some of these bird and mammal species are affected directly or indirectly by bowhead whaling activities associated with Alternatives 2, 3, 4, and 5:

- Disturbance and non-lethal stressors associated with whaling activities (marine species);
- Mortality associated with supplying whaling crews with food (seals, caribou);
- Mortality associated with whaling equipment (bearded seal, walrus, furbearers);
- Personal defense mortality of polar bears attracted to hunting camps and butchering sites;
- Mortality associated with subsistence harvests for community celebrations (waterfowl, caribou, seals); and
- Mortality associated with subsistence harvests of alternative food sources when whaling is not successful (marine and terrestrial species).

Other species (North Pacific right whales, gray whales, minke whales, killer whales, harbor porpoise, short-tailed albatross, and many terrestrial mammals) would incur no or negligible indirect effects from potential vessel or land-based disturbance associated with subsistence activities; these species will not be considered further in this FEIS. For North Pacific right whales in particular, traditional ecological knowledge (TEK) and mitigation measures built into this action will result in whalers exercising diligence and utilizing their considerable expertise to positively identify the species of any targeted whale before they attempt to strike it. The mitigation measures[32] built into this action include:

- Drawing on the traditional knowledge of St. Lawrence Island bowhead captains and western knowledge of right whale scientists, NMFS will collaborate with the AEWC and the St. Lawrence Island bowhead whale hunters to develop an outreach program. This program is intended to document and share knowledge to ensure that all current and future bowhead hunters in the Bering Sea and Chukchi Sea know how to discriminate right whales from bowhead whales during the process of hunting, know that they should not approach, pursue, disturb, or strike a North Pacific right whale, and know concrete steps they can take during hunting to ensure that they do not strike a North Pacific right whale.

[32] It should be noted that these mitigation measures have already been largely implemented. Gambell and Savoonga whalers, along with their partners, have already developed their own educational materials to aid whalers in discriminating between bowhead and right whales. They are generally able to identify non-bowhead whales at a great distance under most conditions, and there have been no verified reports of right whales having been harvested by these whalers.

- The AEWC and NMFS will share this outreach in villages that hunt bowhead whales in the Northern Bering Sea using methods that the AEWC determines are culturally appropriate and effective. Since the North Pacific right whale is so rare and there is some uncertainty about their range, the AEWC and NMFS will also share this information with hunters in other bowhead hunting villages.

We evaluated the direct and indirect impact of the alternatives on other species and determined them to be either so minor as to be negligible or so unlikely as to be discountable. We have therefore determined that there will be no measurable cumulative impacts to assess. There are no incremental or synergistic effects of the alternatives that will add to or interact with the effects of other cumulative actions. The effects of past and present activities within the project area have been considered in **Section 3**, the description of the Affected Environment. Further consideration is given to species listed as endangered or threatened under the Endangered Species Act by USFWS in the Project Area, including: Steller's eider (*Polysticta stelleri*) (threatened), Spectacled eider (*Somateria fischeri*) (threatened), Short-tailed albatross (*Phoebastria albatrus*) (endangered), Polar bear (*Ursus maritimus*) (threatened), Eskimo curlew (*Numenius borealis*) (endangered), for which the alternatives could contribute to cumulative effects.

Section 3, Affected Environment, summarizes the major natural and human-influenced factors that affect different wildlife species in the Arctic. For most of these species, reasonable population estimates and trends are not available, so it is difficult to establish the relative importance of natural and human influenced factors to population level effects. Some of the major human influenced factors that contribute to cumulative effects on these species include:

- Subsistence and sport hunting;
- Noise and disturbance from motorized vehicles, aircraft, and vessels;
- Environmental contamination (air, water, and land) from distant industrial and agricultural sources;
- Oil and gas development on land and in marine waters;
- Oil spills and other discharges from marine traffic;
- Noise and pollution from oil and gas development;
- Environmental changes due to global warming; and
- Commercial fishery interactions.

All of the human activities and factors described above that have contributed to effects on other wildlife in the past are likely to continue in the future. The relative importance of various factors and intensity of effects on different species is likely to change over time, especially as environmental (climate) changes become more pronounced. Although extensive modeling efforts are underway to help predict changes in the physical environment (ACIA, 2004; IPCC, 2007), the synergistic responses of animals and humans to future environmental conditions are very difficult to predict.

As described above for bowhead whales, there is a remote chance of a VLOS occurring during offshore drilling operations. A VLOS could contribute substantially to cumulative effects of injury and mortality. Impact levels may vary by species and depend on timing and location of a spill and subsequent clean-up efforts, species abundance and distribution in the area, and their relative vulnerability or resilience. Ice seals can purge their bodies of hydrocarbons through renal and biliary pathways and, like walrus, are not dependent on fur for insulation, leaving them less susceptible to thermoregulatory effects of oiling. Although ice seals can get lesions on their eyes and some internal organs from contacting crude oil, many of the physiological effects self-correct if the duration of exposure is not too great (Engelhardt et al., 1977; Engelhardt, 1982; 1983; 1985; Smith and Geraci, 1975; Geraci and Smith, 1976a,b; St. Aubin, 1990). It is not clear whether walrus are able to metabolize small amounts of oil as has been demonstrated with ringed and bearded seals, but they have a similar physiology, so tissue damage may be temporary unless they are exposed to chronic contamination (Kooyman et al., 1976). Chronic exposure may result in mortality or long term sub-lethal effects that reduce overall fitness and survival. Polar bears are susceptible to oil spill-induced injury and death through lost insulation value of their fur and ingestion of oil through grooming or contaminated prey (Hurst and Oritsland, 1982; Neff, 1990). Polar bears are curious about new things in their environment and may not avoid oil spill areas or contaminated prey or carcasses (St. Aubin, 1990; Derocher and Stirling, 1991).

A VLOS could also contribute substantially to the cumulative effects of disturbance on ice seals, walrus, and polar bears. Activities associated with spill response and cleanup, such as vessel and aircraft traffic, booming and skimming operations, drilling a relief well, research, and monitoring, could continue for several months post-incident and cause disturbance and displacement throughout the response area. Walrus are particularly sensitive when hauled out on land, where disturbance from vessels and low-flying aircraft could cause stampedes and trampling events.

In the unlikely event that a VLOS were to occur during offshore drilling operations, marine and ice-obligate species would be particularly vulnerable. Such an event could result in negligible to major cumulative effects of disturbance, injury, and mortality. The contribution of Alternative 1 to cumulative effects with a VLOS scenario could be minor to moderate, since in the absence of bowhead whaling, subsistence hunting pressure on other species would increase. Alternatives 2, 3, and 4 would reauthorize the existing level of bowhead harvest, so existing levels of subsistence harvest of other species would continue. Alternative 5 would authorize 100 strikes per year, subject to a six-year landed limit of 504 whales, so existing levels of subsistence harvest of other species would likely continue. However, if a VLOS were to result in reduced bowhead abundance requiring restrictions on whaling, then subsistence hunting directed to other species would increase. If other marine species were also adversely affected by a VLOS, then new hunting activity might represent an additive effect of moderate to major magnitude. As a result, it is possible that hunting might be limited or suspended in areas impacted by a VLOS. Timing and location of such an incident would largely determine cumulative effects.

Major conservation concerns in the Arctic include substantial reductions in sea ice and ice pack habitat (ACIA, 2004). Ice-obligate species (e.g., walrus, ringed seals, bearded seals, and polar bears) are intricately tied to and heavily dependent upon sea ice for feeding, breeding, pupping, and resting, making them particularly vulnerable to climate-driven changes to sea ice conditions (Moore and Huntington, 2008). Concern over habitat degradation and loss due to climate change prompted petitions to list these four species as either threatened or endangered under the ESA. Following extensive litigation, polar bears, the Beringia and Okhotsk subspecies of bearded seals, and the Arctic, Okhotsk, and Baltic subspecies of ringed seals are now listed as threatened (73 FR 28212; 77 FR 76706, 77 FR 76740).

Recent shifts in distribution and habitat use by polar bears and walrus are attributed to loss of sea ice habitat. In the past, most denning female polar bears in Alaska chose den sites on the pack ice (Amstrup and Gardner, 1994), but the majority now den on l and, which is a trend that is expected to continue into the future (Fischbach et al., 2007). Delayed formation of sea ice in the fall is causing more bears to remain longer on land where they are more susceptible to starvation and interactions with people, resulting in an increased chance of being killed in defense of life or property (Amstrup, 2000). The recent use of coastal haulouts by aggregations of walrus along the northwestern Alaska coast was attributed to the loss of sea ice over the Chukchi Sea continental shelf (Clarke et al., 2011; Allen and Angliss, 2011; Fischbach et al., 2009). Use of shore-based haul outs may leave walrus, particularly calves and juveniles, vulnerable to disturbance-related stampedes and trampling mortalities (Fischbach et al., 2009).

While ice-obligate species experience habitat loss as sea ice retreats, ranges of some sub-Arctic and temperate species, such as fin and humpback whales, are expanding into the Chukchi and Beaufort seas (Clarke et al., 2011; Hashagen et al., 2009).

As described in previous sections, under Alternative 1, it is likely that hunting pressure and associated disturbance on other wildlife species (especially seals, walrus, and caribou) would increase substantially to compensate in part for the loss of the whale harvest. This might result in minor to moderate reductions in game populations around the whaling communities. Depending on the species, these populations are managed for sustainable harvests by the Alaska Department of Fish and Game (ADF&G), the Federal Subsistence Board, and jointly by federal agencies and Alaska Native Organizations under co-management agreements. For ice-obligate species, cumulative effects are likely to be dominated by the effects of climate change, as detailed above.

The contribution of Alternative 1 would be minor to moderate based on increased harvest and associated disturbance of ice-obligate marine mammals (e.g., ice seal and walrus populations), at least near whaling communities. Increased harvest of terrestrial game species might add to the complexity of managing game populations, especially with the uncertainty of how climate change will affect different terrestrial species. For other species, including threatened and endangered species, cumulative effects are likely to be dominated by conservation issues independent of whaling activities, as outlined above. The contribution of Alternative 1 to the cumulative effects on these species, due to increased hunting effort, would be moderate for important game species (e.g., caribou) and minor for other species.

Alternatives 2, 3, and 4 would result in similar amounts of whaling activity and harvest over a six-year period, although total take levels could vary slightly between these alternatives, due to differing provisions concerning carry-forward of unused strikes. Alternative 5 would result in an increase in whaling activity and harvest over a six-year period. Based on low magnitude, limited geographic extent, and short-term duration, the direct and indirect effects of these alternatives are considered to be negligible to minor for other wildlife, depending on the species. For ice-obligate species (ice seals, walrus, and polar bears), cumulative effects are likely to be dominated by the effects of climate change, as described above, and the contribution of the alternatives is considered negligible, since bowhead harvests would continue, and other resources would continue to play their current role in the subsistence harvest annual round. For other species, including threatened and endangered species, cumulative effects are likely to be dominated by conservation issues independent of whaling activities, as outlined above. The contribution of the alternatives to the cumulative effects on these species is considered negligible.

4.10 Direct, Indirect, and Cumulative Effects of the Alternatives and Other Activities in the Project Area on the Sociocultural Environment

4.10.1 Effects on Subsistence Patterns

The past, present, and future importance of the bowhead whale in these Alaska Native villages cannot be overemphasized. The AEWC has stated that, "…whaling, more than any other activity, fundamentally underlies the total lifeway of these communities" (AEWC, undated). Alaska Natives have hunted the bowhead whale for over 2,000 years, and the hunt remains the dominant aspect of their culture. Subsistence whaling is a year-round activity in these villages, beginning each winter with: preparation of skin boats; caribou hunting for meat supplies for the crews and sinew for sewing the bearded seals skins used for *umiaks*; preparation of ice cellars; and outfitting the camps with supplies. Spring whale hunting involves shared labor in harvesting followed by widespread distribution of bowhead whale food and cultural events celebrating the harvest. By summer time, whalers are hunting for bearded seals for use in building *umiaks* for the following year's spring bowhead hunt, followed by autumn whaling in Utqiaġvik (Barrow), Nuiqsut, Kaktovik, Wainwright, Gambell and Savoonga.

Bowhead whale meat, *maktak*, and oil have long provided, and continue to provide, important contributions to the Inuit diet. *Maktak* and oil are especially valuable in supplying high-calorie protein in a cold and harsh climate. Subsistence foods are highly nutritious and contain heart-healthy fats (Nobmann [1997] in MMS, 2006d). A study found that Alaska Natives with higher levels of polyunsaturated fats, found in fish oils and marine mammals, had lower heart disease mortality (McLaughlin et al., 2005). A permanent loss of whale meat could precipitate the physical, psychological, and cultural trauma that often accompanies drastic and forced dietary changes (Michie, 1979). The sale of bowhead whale meat is prohibited, however, edible portions are shared throughout the communities of Alaska's North Slope and beyond. Bowhead whales also provide raw materials for the creation of Native handicrafts, which may be legally sold.

In 1997, the AEWC documented a level of 280 landed whales over a five-year period as necessary to provide for the nutritional and cultural needs of these communities. The 2012 need statement of the AEWC (**Appendix 8.1**) considers the 2010 U.S. Census results for the 11 participating AEWC communities and documents a continuing need of 57 landed bowhead whales per year. Any alternative that would provide fewer whales would be expected to have some level of adverse impact to socioeconomic and cultural needs of these villages. It is not likely that the nutritional or cultural void created would or could be filled with substitute foods. Imported foods cannot readily take the place of whale and other marine mammals, which are central to the cultural identity and diets of Alaska Natives (Michie 1979).

An updated need statement will be developed by the AEWC and submitted to the IWC for review in advance of its 67th meeting in September 2018. This updated need statement will be considered in the Final EIS for this proposed action.

Alternative 1 (No Action)

Under Alternative 1, there would be no federal authorization of subsistence bowhead whaling for 2019 and beyond. With no subsistence whaling, the direct effects of this alternative would include the loss of tens of thousands of pounds of highly nutritious and highly valued food, attenuation of the social cohesion occasioned by the shared work among whaling crews and other cooperators in the year-round work of preparation for whaling, disruption in the bonds established through food sharing, and diminished opportunities for young people to continue to learn the knowledge, practice, and beliefs associated with this central cultural institution (Worl 1979). The indirect effect of Alternative 1 would be likely to result in redirection of subsistence harvest effort to other subsistence resources, but it is unlikely that the volume of food produced in whaling could be recreated. Instead, local residents would be more likely to increase their use of imported foods; and, given the high costs of imported foods, especially for frozen and fresh foods, it is likely that the increase would be in imported foods of lower nutritional value.

Inuit leaders and institutions would likely contest the elimination of subsistence bowhead whaling, as they did in 1977 at the time of the IWC moratorium (Langdon, 1984). This might involve litigation, and highly charged efforts to petition federal agencies and the Congressional delegation seeking relief. Alternative 1 would likely be viewed by the AEWC as a failure by the U.S. government to uphold rights of Alaska Natives. Since the MMPA and ESA expressly provide for the right for Alaska Native subsistence hunting, and since there is no conservation-based rationale for denying the subsistence whaling quota, elimination of a quota would not comport with NMFS's objective to accommodate federal trust responsibilities to the fullest extent possible consistent with applicable law. Alternative 1 could also result in confrontation between the AEWC and NMFS. Cooperative research and management efforts between the AEWC and NMFS that benefit marine mammals could be jeopardized.

The loss of such an important subsistence food resource would be an adverse impact of major magnitude. Since all AEWC communities would be similarly affected, this impact would be major in geographic extent. The duration of such an effect would be uncertain, since NMFS might revisit such a decision in a subsequent year, or it could last for the five year or six year period of the current IWC authorizations for aboriginal subsistence whaling. In all, the direct, indirect, and cumulative effects of Alternative 1 on subsistence patterns would be adverse and major (**Table 4.1-3**). Cumulative effects on subsistence harvest patterns from the oil and gas activities and climate change, described in **Sections 4.6.1 and 4.6.2**, would be minor to moderate, except that a VLOS could have major effects. The contribution of Alternative 1 to cumulative effects on subsistence harvest patterns would be adverse and major, in that the near-term effects of discontinuing bowhead whaling would be far greater than the other impacts of oil and gas activity, or climate change. In summary, the direct, indirect, and cumulative effects of Alternative 1 on subsistence harvests would be major and adverse.

Alternative 2

Alternative 2 would provide for continued subsistence bowhead whaling at a level that would, under ideal hunting conditions, address the identified Alaska Native cultural and nutritional subsistence needs. However, Alternative 2 provides for no carry-forward of unused strikes. The direct effects would include continuation of the subsistence food contribution of bowhead whales, the cooperative work and food sharing practices, and crucial cultural learning opportunities for young people. Indirect effects would include continuation of the current levels of diversity in subsistence resource uses, and continuing levels of reliance on subsistence foods, supplemented by purchased foods.

Alternative 2 would avoid the adverse reaction to no subsistence whaling quota predicted under

Alternative 1. However, with no carry-forward of unused strikes, Alternative 2 would not provide the flexibility that whaling captains have required for many years. Indeed, in prior years, when adverse weather conditions hindered hunting activities late in a year, whaling captains had confidence that unused strikes would be available in a subsequent year, although these have actually been used infrequently (i.e., twice in the period 1998 - 2010, as shown in **Figure 3.2.12**). The availability of these unused strikes and the flexibility they afford also help to alleviate a sense of pressure among hunters to take all strikes when they are available. This sense of pressure can have an adverse effect on hunting efficiency, as hunters feel the need to try to take whales under less than favorable conditions. The lack of flexibility provided by the carry-forward can also foster a tendency toward competition. A competitive pressure was introduced into this hunt during the years of lower IWC catch limits, but has been alleviated in more recent years with the increase in catch limits to a level consistent with need, and the flexibility afforded by the carry-forward of unused strikes. The introduction of competitive pressure in this hunt undermines the socially valuable characteristics of cooperation and sharing that the hunt itself has fostered historically in the AEWC communities and helps to preserve today. The lack of this flexibility is an adverse effect in subsistence patterns, although relative to Alternative 1, overall the direct and indirect sociocultural effects of Alternative 2 are considered beneficial, and of major magnitude, extent, and duration.

The contribution to cumulative effects on subsistence harvest practices from Alternative 2 would be major and beneficial, and would help to offset the cumulative effects of disturbance and displacement of subsistence activities due to oil and gas activities, including noise and oil spills, and ecosystem impacts from climate change as outlined in **Section 4.6.1** and **Section 4.6.2**. With oil and gas activities, whales may adjust migration routes around areas of high noise, or in the event of an oil spill, alter feeding activities to avoid contaminated waters. While temporary and local in nature, these disruptions might make subsistence whaling more time-consuming and, in periods of rough seas, more dangerous. These disruptions could also result in bowhead whales being unavailable to some of the communities if the whales move too far offshore to avoid noise or contamination. The authorization of bowhead whaling gives this activity standing and profile before the regulatory agencies and industry, and may contribute to the pressure to identify effective mitigation measures required by the BOEM and NMFS from industry. To minimize disturbances, the Open Water Season Conflict Avoidance Agreement (CAA) negotiated between industry and the AEWC (MMS, 2006d), includes provisions for quiet periods when industry activity in specific areas ceases before and during the active hunt, and onboard marine mammal observers and vessel speed and distance restrictions to reduce the possibility of ship strikes.

Disturbances from an oil spill, especially a VLOS, have the potential to affect bowhead harvest activities if the spill occurs during the bowhead whaling season and if it occurs in bowhead habitat. This concern was voiced by Donald Long, a resident of Utqiaġvik (Barrow), at the public hearing for the Beaufort Sea Planning Area Oil and Gas Lease Sale 124 in April of 1990:

- Any disruption, whether it be oil spill or noise, would only disturb the normal migration, and a frightened or a tense whale is next to impossible to hunt.

- At the same meeting in Utqiaġvik (Barrow), Marie Adams also voiced concern that an oil spill would significantly impact bowhead whale migration routes through the ice:

- An oil spill in the fragile ecosystem of the Arctic could devastate the bowhead whale. These animals migrate through narrow open lead systems which could be the preferred path of an oil spill.

- The magnitude of effects of a VLOS on subsistence harvest patterns depends on seasonal and other factors.

Generally, spring whaling occurs before seismic activities are underway, and mitigation measures and the CAA create exclusion zones to avoid seismic activities in specified areas before and during the fall hunts of specific communities when whales are nearby. Cumulative effects on spring whaling would be rated as minor. For fall whaling, the likelihood of impacts is less certain, because it turns on the effectiveness of mitigation measures. The NSB and the AEWC have expressed concern about the potential for growing levels of seismic exploration to deflect bowhead whales further offshore and for longer periods away from the traditional harvest areas. This impact would increase the displacement of traditional subsistence whaling practices, requiring greater travel distances, time and cost. On the basis of current knowledge, this analysis concludes that there are deflection effects of noise associated with oil and gas activity, though those effects are not completely known, and that the potential for disturbance to the whales and to subsistence whalers would result in cumulative sociocultural effects that can be considered moderate in magnitude, and generally minor in duration. The impact of a VLOS could be adverse and major on bowhead populations as noted in **Section 4.6.6.1**, and could result in reduced subsistence whaling opportunities. The contribution of Alternative 2 to cumulative effects on subsistence patterns would be positive and would in part offset any adverse effects of other activities on subsistence practices. In the case of a VLOS, the magnitude of adverse cumulative effect on subsistence resources may be such that subsistence bowhead whaling harvest, and potentially the allocation, might be limited or eliminated, based on, at least, the advice of the IWC's Scientific Committee, removing the beneficial effect.

Alternative 3

Under Alternative 3, the direct and indirect effects on subsistence harvest practices would be nearly identical to Alternative 2 (**Section 4.8.1.2**) but would provide for the longstanding flexibility to carry-forward up to 15 unused strikes into subsequent years. In contrast to

Alternative 2, the carry-forward feature of Alternative 3 would provide whaling captains with the continuing confidence that if adverse weather prevents a safe hunt late in the season, they may recoup the opportunity in following years through the carry-forward of up to 15 unused strikes per year. Direct, indirect, and cumulative effects would be the same described for Alternative 2. In total, the contribution of Alternative 3 to cumulative effects on subsistence patterns would be beneficial, and major in magnitude, extent, and duration. Bowhead whaling with authorization under Alternative 3 would offset in part the adverse effects of other activities on subsistence practices. In the case of a VLOS, the magnitude of adverse cumulative effect on subsistence resources may be such that subsistence bowhead whaling harvest, and potentially the allocation, might be limited or eliminated, based on, at least, the advice of the IWC's Scientific Committee, removing the beneficial effect.

Alternative 4 (Preferred Alternative)

Alternative 4 would provide for the same continuity in subsistence harvests and related social and cultural benefits as Alternative 3. However, Alternative 4 would provide for additional flexibility to carry-forward up to 33 unused strikes into subsequent years. Direct, indirect, and cumulative effects would be the same described for Alternative 3. In total, the contribution of Alternative 4 to cumulative effects on subsistence patterns would be beneficial, and major in magnitude, extent, and duration. Bowhead whaling with authorization under Alternative 4 would offset in part the adverse effects of other activities on subsistence practices. In the case of a VLOS, the magnitude of adverse cumulative effect on subsistence resources may be such that subsistence bowhead whaling harvest, and potentially the allocation, might be limited or eliminated, based on, at least, the advice of the IWC's Scientific Committee, removing the beneficial effect.

Alternative 5

Under Alternative 5, the direct and indirect effects on subsistence harvest practices would be nearly the same as Alternative 4, though with increased harvest levels over any six-year period. Overall the direct and indirect sociocultural effects of Alternative 5 are considered beneficial, and of major magnitude, extent, and duration. The contribution of Alternative 5 to cumulative effects on subsistence patterns would be beneficial and major in magnitude, extent, and duration, and this would in part offset any adverse effects of other activities on subsistence practices. In the case of a VLOS, the magnitude of adverse cumulative effect on subsistence resources may be such that subsistence bowhead whaling harvest, and potentially the allocation, might be limited or eliminated, based on, at least, the advice of the IWC's Scientific Committee, removing the beneficial effect.

4.10.2 Effects on Inuit Health: Nutritional Benefits and Risks

In addition to the food volume produced through subsistence bowhead whaling, nutritional benefits and risks can be assessed, at least in qualitative terms. As a result of industrial pollution, long distance vectors for transport and deposition in Arctic environments, and high rates of persistence, many contaminants are found in Arctic subsistence resources. As described in **Section 3.2.6**, bowhead whale subsistence foods have been analyzed for their levels of contaminants, including PCBs, dichlorodiphenyltrichloroethanes (DDTs), organochlorines (OCs), chlordanes, and heavy metals. These contaminant levels varied with gender, length/age, and season, but were generally relatively low compared to other marine mammals. Reports by the Arctic Monitoring and Assessment Programme (AMAP) identified levels of contamination meriting closer public health attention in some parts of the Arctic, through generally not in Alaska (AMAP, 2009a,b).

At the same time, public health officials recognize that the loss of subsistence foods would have far-reaching consequences throughout the sociocultural system of small, predominantly indigenous communities. A report from the Alaska Division of Public Health, Section of Epidemiology in 1998 observed that:

- Changes in diet, lifestyle, and the social and cultural disruption that follows the cessation of subsistence may contribute to a wide array of changes in communities from increases in obesity and diabetes, to increases in violence, alcoholism and drug abuse (Egeland et al., 1998:9).

Moreover, highly nutritious subsistence foods are generally replaced by nutritionally inferior purchased foods. The report further stated:

- The market foods that often replace locally harvested wildlife are high in saturated fat and vegetable oils and carbohydrates and often lower in nutrient value. In addition, dietary changes are complex in nature, often coinciding with a number of other lifestyle changes that also contribute to increases in chronic diseases such as heart disease, diabetes, and cancer (Egeland et al., 1998:9).

In a 2004 update on risk and benefits of traditional foods, the Alaska Section of Epidemiology studied mercury contaminant levels in fish and marine mammals, including data on hum an uptake (i.e., biomonitoring through hair samples). This study reiterated the findings of the 1998 report and continued to recommend, "…unrestricted consumption of fish and marine mammals from Alaska waters as part of a balanced diet…" (Arnold and Middaugh, 2004:2). Another indication of the positive benefits of subsistence foods is found in a study of blood samples from Alaska Native mothers which concluded that Iñupiat mothers with subsistence diets high in land mammals and bowhead whale have lower levels of organochlorines and metals in comparison to Yupik mothers, who consume greater amounts of pacific salmon and seals (AMAP, 2009b).

In short, documented contaminant levels in bowhead whales in Alaska do not represent a threat to the health of subsistence users at current levels. Given the low levels of risk, public health officials conclude that the nutritional decline from loss of subsistence foods, like bowhead whale meat and blubber, would be far more adverse.

Alternative 1 (No Action)

Under Alternative 1, there would be no federal authorization of subsistence bowhead whaling for 2019 and beyond. The direct effects of this alternative, assuming no unauthorized whaling, would be to eliminate the nutritional benefits of bowhead whale consumption, and to eliminate exposure to the low contaminant levels in bowhead whale meat and blubber. Indirect effects would include consumption of a different mix of subsistence foods, as hunters redirect their harvest efforts to species not prohibited to them. However, it is unlikely that redirected subsistence hunting effort could replace the exceptional volume of bowhead whale food for most of the affected communities. Instead, it is likely that purchased food of inferior nutritional value would become a larger portion of total food consumption, with deleterious health effects. As noted above, the loss of a central subsistence harvest activity may also contribute to behavioral health problems. The AEWC considers it very important to recognize the adverse nutritional and behavioral health effects that would likely follow if bowhead subsistence whaling were prohibited (AEWC, undated). In their view, this category of impacts has not previously been given sufficient attention.

Because it would affect a large portion of all of the AEWC communities, the effects of Alternative 1 would be adverse and major in magnitude and geographic extent. The duration of these effects is unknown, since the NMFS could revisit its decision in a subsequent year, or the decision to deny a subsistence whaling quota could continue from the period 2019 and beyond. In all, the effects of Alternative 1 on the nutrition and health would be adverse and major (**Table 4.1-3**).

Alternative 2

Alternative 2 would reauthorize subsistence bowhead whaling at a level sufficient to address the identified Alaska Native cultural and nutritional subsistence needs, with no provision for carry-forward of unused strikes into a subsequent year. The direct effect of this alternative would be to continue the significant positive contributions of bowhead whale foods to the nutritional level of subsistence users. Concurrently, subsistence users would continue their low levels of exposure to contaminants in bowhead meat and blubber. Few indirect or cumulative effects would be expected, as this alternative provides for continuity in bowhead harvest levels, rather than redirection to other subsistence resources or purchased foods. The lack of provisions for carry-forward of unused strikes may make a very small difference in harvest levels. Carry-forward provisions provide flexibility to whaling captains late in the season. While they have rarely been used, as noted under the discussion of socio-cultural impacts, their availability has positive psychological and socio-cultural benefits, and may have a positive effect on struck and lost ratios in this hunt. Since this alternative does reauthorize the subsistence hunt, the effects of Alternative 2 on nutrition and health would be beneficial and major in magnitude, extent, and duration, securing a substantial subsistence harvest opportunity for all AEWC communities for any six-year period.

Alternative 3

Under Alternative 3, the direct and indirect effects on the nutritional level of subsistence users would be nearly identical to Alternative 2, would increase the longstanding flexibility to carry-forward up to 15 unused strikes into a subsequent year. The additional flexibility provided by the opportunity to carry-forward unused strikes into a subsequent year is expected to have a small, but positive, effect on harvest levels. Although this flexibility has rarely been used, carry-forward of unused strikes could increase the take in a year following one in which adverse weather prevented optimal hunting success. Because this alternative reauthorizes the subsistence hunt, the effects of Alternative 3 on nutrition and health would be beneficial and major in magnitude, extent, and duration, securing a substantial subsistence harvest opportunity for all AEWC communities for any six-year period.

Alternative 4 (Preferred Alternative)

Alternative 4 would provide for continuity in subsistence harvests and related social and cultural benefits under the same harvest authorization for landed whales that has been in place since 1997. Alternative 4 would increase the longstanding flexibility to carry-forward from up to 15 unused strikes into a subsequent year to up to 33 unused strikes. The direct, indirect, and cumulative effects of Alternative 4 on health and nutrition are greater than those in Alternative 3, given the opportunity to carry-forward more unused strikes from previous years. The additional flexibility provided by the opportunity to carry-forward unused strikes into a subsequent year is expected to have a small, but positive, effect on harvest levels. Although this flexibility has rarely been used, carry-forward of unused strikes could increase the take in a year following one in which adverse weather prevented optimal hunting success. Because this alternative reauthorizes the subsistence hunt, the effects of Alternative 4 on nutrition and health would be beneficial and major in magnitude, extent, and duration, securing a major subsistence harvest opportunity for all AEWC communities for any six-year period.

Alternative 5

Under Alternative 5, the direct and indirect effects on the nutritional level of subsistence users would be nearly the same as Alternative 4, although with increased harvest levels over any six-year period. As a result, the effects of Alternative 5 on nutrition and health would be beneficial and major in magnitude, extent, and duration, securing a major subsistence harvest opportunity for all AEWC communities for any six-year period.

4.10.3 Effects on Inuit Public Safety

Subsistence whaling carries a range of inherent risks, including the dangers of using small, open boats in Arctic waters, shore ice breaking off and isolating whaling camps, and accidents on the ice as snow machines travel from the village to ice edge whaling camps. Iñupiat and Siberian Yupik whalers have long expressed a profound concern for safety. A rich body of oral history includes episodes of hunters thrust into life threatening situations, as lessons for survival. Cumulative traditional knowledge and ongoing close-grained observations of weather and ice conditions are topics of constant discussion, as whaling captains and crews assess safety and risks arising from these conditions (George et al., 2004b).

Another class of safety risks arises from the incorporation of new technologies into whaling, ranging from the historic adoption of the harpoon bombs in the 19th Century Yankee whaling era, to more recent use of heavy equipment and steel cables to haul massive bowhead whales up onto the ice. The AEWC has implemented a program to promote hunter safety and efficiency, including the use of newer penthrite projectiles.

Several past episodes are representative of the risks involved in whaling. In a tragic accident in 2005, a skin-covered whaling boat from Gambell capsized while helping to tow a bowhead back to the community overnight in eight-foot swells. The mayor of Gambell, his two children, and another adult drowned, while two crewmembers survived (Spero News, 2005; Siku Circumpolar News Service, 2005). In the mid-1990s, a Nuiqsut whaling boat capsized while on a resupply run in rough seas during the fall hunt; one hunter died. In a report to the IWC, the AEWC referred to an accident during a hunt in Utqiaġvik (Barrow), in which "one of the most experienced harpooners in the Arctic was killed when his boat capsized while towing a whale; he was trapped under it [the boat]" (AEWC, 2006). In the early 1980s, six whale hunters from Savoonga survived a capsizing accident just after harpooning a large bowhead whale (Alaska Magazine, 1982).

Two major episodes of sudden break-off of the ice are recounted in George et al., (2004b). In a famous episode of onshore ice thrust, known in Iñupiat as *ivu*, in 1957, the breakup of shorefast ice was so sudden and abrupt that whaling camps and equipment were abandoned and dog teams cut loose, as whalers scrambled for shore. No lives were lost, but the event became famous as a warning about setting camp on flat pans of multi-year ice, referred to as *piqaluyak*. It took many years for whaling crews to recover and obtain new equipment. In 1997, 12 whaling camps and 142 people were carried off as the shorefast ice broke off, an event referred to as *uisauniq*. Although captains recognized some signs of unstable ice, this particular episode arose suddenly, without time to retreat to shore. Fortunately, many whalers had GPS equipment and radios, and the Utqiaġvik (Barrow) Search and Rescue helicopters were able to retrieve all hunters with no loss of life (George et al., 2004b). In another example of risks attributable to changes in ice quality, NSB officials cite recent instances of hunters falling through ice while traveling on snow machines from the community to the camps (R. Suydam, NSB, Pers. comm.).

Injuries involving accidental discharge of harpoon bombs have occurred. In 1940, an anthropologist working in Point Hope reported four accidental explosions of the shoulder guns, resulting in one death and one injury (Rainey, 1940). Three members of a Utqiaġvik (Barrow) whaling crew sustained injuries, serious in one case, when a bomb exploded in the whale gun in May 1968 (Naval Arctic Research Laboratory, 1968). Another accident involving equipment failure was reported in Utqiaġvik (Barrow) in 1992, when the block and tackle gear used to haul the whale up on the ice broke and flying cables killed two women (R. Suydam, NSB, Pers. comm.). A hunter lost three fingers on his left hand when an explosive charge in a darting gun detonated during a bowhead whale hunt off Point Hope on April 21, 2018.

From the perspective of cumulative effects, the trends of several of these dangers associated with whaling interact with the effects of climate change, as the shorefast ice environment becomes more unstable and less predictable. In addition, changes in open water lead patterns oblige whaling crews to pursue bowhead whales for greater distances. Weather conditions may be less predictable and therefore more dangerous to whaling crews. Declines in the thickness of shorefast ice due to global warming increase the dangers of breakoffs, in which camps are separated from land, with substantial dangers to the whaling crews (George et al., 2004b).

Alternative 1 (No Action)

Under Alternative 1 (No Action), there would be no federal authorization of subsistence bowhead whaling for 2019 and beyond. The direct effect of this moratorium would be to avoid exposure to the risks associated with whaling. However, as an indirect effect, subsistence efforts would be redirected to other resources and these involve risks as well. Harvest of other marine mammal species, such as seals and walrus, may involve similar risks, though in lesser degree. In the cumulative case, the effects of climate change are increasing the risks associated with less predictable weather, dangerous open water conditions, and unstable ice. The contribution of Alternative 1 to cumulative effects on public safety would be beneficial and would serve to moderate the safety risks associated with climate change. The contribution to cumulative effects on public safety are unclear. Subsistence harvest effort redirected to other resources would involve similar risks on the ice and open water, though not through the use of harpoon guns and large block and tackle equipment. Since the effects of this alternative would reach all AEWC communities they would be rated major in geographic extent. The duration of such an effect would be uncertain, since NMFS might revisit such a decision in a subsequent year, or it could last for the years 2019 and beyond. In all, the direct, indirect, and cumulative effects of Alternative 1 on subsistence patterns would be adverse and major (Table 4.1-3). As discussed in section 4.8.1.1, Alaska Native leaders would likely contest the decision not to issue a federal authorization, and confrontation between NMFS and Alaska Native hunters could result. In addition, the loss of this important cultural activity could result in the breakdown of social systems, leading to increases in substance abuse and incidents of violence toward self and others, potentially offsetting the minor beneficial effects on public safety from Alternative 1.

Alternative 2

Alternative 2 would provide for subsistence bowhead whaling at a level that would address the identified Alaska Native cultural and nutritional subsistence needs. However, Alternative 2 provides for no carry-forward of unused strikes. Direct and indirect public safety effects of this alternative would be continuing exposure to the current levels of risk inherent in bowhead whaling, and other subsistence pursuits. The public safety incidents are very infrequent, and so are rated minor in duration and frequency. The provisions regarding carry-forward of unused strikes would not appreciably change the effects of this alternative. The cumulative effects would be dominated by the effects of climate change on the public safety of marine subsistence activities, as noted in the assessment for Alternative 1. The contribution of Alternative 2 to cumulative effects on public safety would be minor in relation to the large-scale effects of climate change.

Alternative 3

Under Alternative 3, the direct and indirect effects on the public safety would be nearly identical to Alternative 2 but would provide for flexibility to carry-forward up to 15 unused strikes per year into subsequent years. Since the annual harvest rate and levels of risk inherent in bowhead whaling are expected to remain the same under Alternative 3, this extension would have no additional impact on public safety. As a result, the effects of Alternative 3 on public safety would be minor in duration and frequency with the provision regarding carry-forward of unused strikes not appreciably affecting impacts.

Alternative 4 (Preferred Alternative)

Alternative 4 would provide for the same continuity in subsistence harvests and related social and cultural benefits as Alternative 3. The only difference is that Alternative 4 would provide for additional flexibility to carry-forward up to 33 unused strikes per year into subsequent years. This would have the beneficial effect of providing flexibility so that whaling captains could avoid bad weather with confidence that the opportunities they forego would be carried over to a later season. The direct, indirect, and cumulative effects would be the same as those noted for Alternative 3.

Alternative 5

Under Alternative 5, the direct and indirect effects on public safety would be nearly identical to Alternatives 3 and 4. Given that the annual harvest rate and levels of risk inherent in bowhead whaling would increase slightly under this Alternative, the contribution of Alternative 5 to the cumulative effects on public safety would be minor.

4.10.4 Effects on Other Tribes and Aboriginals

The IWC provided for aboriginal groups to hunt whales in the original Schedule adopted in 1946. The Commission began regulating aboriginal subsistence hunts when it first set catch limits for bowhead whales in 1977. Revision of bowhead catch limits, in furtherance of subsistence hunts by Alaska Natives and Chukotkan aboriginal people, sets no new precedent that could increase commercial or subsistence hunts.

The media has reported that Canadian Aboriginal First Nations have also conducted subsistence hunts. Canada is not a member of the IWC, and the U.S. government opposes any hunts by Canadian aboriginal people unless Canada rejoins the IWC and conducts such hunts in compliance with the IWC Schedule. Nonetheless, since 1991, Canada has allowed its aboriginal people to take bowhead whales regularly from the Davis Strait and Hudson Bay stocks of bowhead whales. Infrequently, Canadian Inuvialuit have taken Western Arctic bowhead whales in the eastern Beaufort Sea at the Mackenzie Delta. As noted in Section 3.2.4, the successful harvest of a single whale was reported for 1991 and 1996, respectively.

Alternative 1 (No Action)

Under Alternative 1, there would be no NMFS authorization of subsistence bowhead whaling for the years 2019 and beyond. As described in the No Action sections above, this alternative would result in major adverse effects for the Alaska Native communities. If the Russian Federation did the same, the Chukotkan aboriginal people would also be denied a subsistence hunt. This would represent the loss to the Chukotkan aboriginal people of the food value of up to five bowhead whales authorized per year, although average harvests as described in Section 3.2.4 are closer to one bowhead whale per year. Since the Canadian government has withdrawn from the IWC, the very limited harvest of Western Arctic stock bowheads would continue in the Mackenzie Delta area. As an indirect effect of Alternative 1, working relationships with other tribes might be adversely affected since the tribes might view NMFS's action under this alternative as a breach of faith by the U.S. government in upholding Native subsistence rights. Most Native tribes throughout the U.S. would likely view Alternative 1 as a failure on the part of NMFS to exercise its trust responsibility with respect to Alaska Natives, and possibly to Native Americans in general. In light of the potential for political action by Alaska Natives to defend the bowhead subsistence hunt, described in Section 4.8.1.1 above, the potential impact on other tribes might be moderate to major, depending on the extent to which this would emerge as a national issue among Native American tribes.

Alternative 2

Alternative 2 would provide for a continuing level of subsistence bowhead whaling and would promote cultural diversity and recognize the importance of maintaining traditions for the coherence of Alaska Native groups. This alternative would also make it possible for the AEWC to carry on subsistence hunts authorized by the IWC Schedule. Official recognition that traditional subsistence activities, such as whale hunts, are culturally valuable will be reassuring to Native Americans in general. Thus, Alternative 2 would avoid the adverse, indirect effects of deterioration in working relations between NMFS and other tribes. Alternative 2 does not provide flexibility to the bowhead subsistence whalers in the form of carry-forward of unused strikes into a subsequent year, but this is not likely to affect the working relations of NMFS with other tribes. The effects of Alternative 2 on other tribes would be negligible.

Alternative 3

Alternative 3 would provide for continuation of the subsistence hunts authorized by the IWC Schedule at the current level of flexibility with carry-forward of unused strikes, in that up to 15 can be carried into any subsequent year. Since the annual bowhead harvest rate is expected to remain the same under Alternative 3, this extension would allow AEWC communities to carry on subsistence hunts and would avoid deterioration of working relationships between NMFS and the other tribes. The effects of Alternative 3 on other tribes would be negligible.

Alternative 4 (Preferred Alternative)

Alternative 4 would provide for continuation of the subsistence hunts authorized by the IWC Schedule, with additional flexibility to carry-forward up to 33 unused strikes per year into subsequent years. The direct and indirect effects of this alternative on relations with other tribes are the same as those of Alternative 3. The effects of Alternative 4 on other tribes would be negligible.

Alternative 5

Under Alternative 5, the direct, indirect, and cumulative effects on Alaska Native groups would be nearly identical to Alternatives 3 and 4. This Alternative would allow AEWC communities to carry on subsistence hunts and would avoid deterioration of working relationships between NMFS and the tribes. The effects of Alternative 5 on other tribes would be negligible.

4.10.5 Effects on the General Public

There is a segment of the U.S. population that is opposed to whaling, though this opposition is often focused on commercial whaling (according to letters and environmental group communications to the U.S. government). However, other citizens and non-governmental groups understand and appreciate the cultural and nutritional needs of Alaska Natives to harvest bowhead whales in a subsistence hunt. Some citizens and groups oppose all whaling, no matter the situation.

Alternative 1 (No Action)

Under Alternative 1, there would be no federal authorization of subsistence bowhead whaling for 2019 and beyond. This alternative may be supported by citizens opposed to all whaling. However, as noted above Alternative 1 is likely to result in political action by Alaska Native whalers, appealing for support to the general public. Citizens who support a limited opportunity for aboriginal whaling may be sympathetic to the claims of the Alaska Native whalers that their needs have been sacrificed for ideological reasons. The effects of Alternative 1 on the general public may be seen as mixed, with countervailing tendencies, depending on the position of support or opposition to subsistence whaling held by a particular portion of the general public. The overall result is a moderate impact for the subset of citizens who follow marine mammal management issues, beneficial in the eyes of the anti-whaling public and adverse for those who support indigenous whaling rights, and would be moved by the objections of the Alaska Native whalers to closure of the subsistence whaling opportunity.

Alternative 2

Alternative 2 provides for an ongoing subsistence hunt for bowheads at a level that meets the nutritional and cultural needs. However, this alternative would not provide any flexibility for carry-forward of unused strikes. Citizens who support aboriginal whaling would support this allocation, and would be relieved that confrontations between the subsistence whaling communities and the government agencies have been avoided. Citizens who oppose aboriginal whaling would not support this alternative. The specifics of the provisions on carry-forward of unused strikes are not likely to be consequential to the general public. The effects of Alternative 2 on the general public may be seen as mixed, with countervailing tendencies, depending on the position of support or opposition to subsistence whaling held by a particular portion of the general public. The overall result is a minor impact.

Alternative 3

Under Alternative 3, the direct and indirect effects on the general public would be nearly identical to Alternative 2 but would provide flexibility to whaling captains in that up to 15 unused strikes per year can be carried-forward and added to the strike quota of any subsequent year. The support and opposition to this alterative among the general public would be the same at that described for Alternative 2. The effects of Alternative 3 on the general public may be seen as mixed, with countervailing tendencies, depending on the position of support or opposition to subsistence whaling held by a particular portion of the general public. The overall result is a minor impact.

Alternative 4 (Preferred Alternative)

Alternative 4 provides for the ongoing subsistence whaling allocation at a level that meets the identified need, with additional flexibility to carry forward up to 33 unused strikes per year into any subsequent year. The support and opposition to this alterative among the general public would be the same at that described for Alternative 3. The effects of Alternative 4 on the general public may be seen as mixed, with countervailing tendencies, depending on the position of support or opposition to subsistence whaling held by a particular portion of the general public. The overall result is a minor impact.

Alternative 5

Alternative 5 provides for increased harvest levels over any six-year period. The support and opposition to this alterative among the general public would be the same at that described for Alternatives 3 and 4. The effects of Alternative 5 on the general public may be seen as mixed, with countervailing tendencies, depending on the position of support or opposition to subsistence whaling held by a particular portion of the general public. The overall result is a minor impact.

4.10.6 Environmental Justice

In February 1994, President Clinton issued EO 12898 on Environmental Justice (1994), which requires the federal government to promote fair treatment of people of all races, so no person or group of people bear a disproportionate share of the negative environmental effects from the country's domestic and foreign programs. Fair treatment means that no population, due to lack of political or economic power, is forced to shoulder the negative human health and environmental impacts of pollution or other environmental hazards. Environmental justice means avoiding, to the extent possible, disproportionate adverse environmental impacts on low- income populations and minority communities.

A minority is any individual classified as American Indian, Alaska Native, Asian or Pacific Islander, African American, or Hispanic. A low-income person is a person with a household income at or below the U.S. Department of Health and Human Services poverty guidelines. A minority population and low-income population are defined as any readily identifiable group of minority or low-income persons who live in geographic proximity, and if circumstances warrant, geographically dispersed/transient persons (such as migrant workers or Native Americans) who would be similarly affected by a proposed program, policy, or activity.

Potentially affected populations are identified below in **Section 4.8.5.1**. The analysis of beneficial and adverse effects on minority and low-income populations is presented in **Section 4.8.5.2**.

4.10.6.1 Affected Populations

The communities affected by the proposed action are the 11 member communities of the AEWC. As discussed in Chapter 3, Section 4, "Socioeconomic Environment," these are small, predominantly Alaska Native villages, with the exception that Utqiaġvik (Barrow), as a regional service center, is larger and more diverse. In 2010, the 11 AEWC communities counted a total 8,258 residents, of whom 6,674 or 80.8 percent are Alaska Native or part Alaska Native (Table 3.4-1). Utqiaġvik (Barrow) accounts for just over half of the total population, and is more diverse, with Alaska Native residents making up 68.6 percent of the community. The most recent population estimates are in the 2012-2016 American Community Survey 5-Year Estimate. Comparing this dataset with the information from the 2010 U.S. Census, five AEWC communities have experienced a decrease in population, while the six other AEWC communities have experience population growth. The most current information concerning income and poverty levels is the 2012-2016 American Communities Survey 5-Year Estimate. While it is the best information available, there is a significant margin of error for each estimate and the data should be taken with caution. Table 3.4-2 shows that, using the federally defined poverty level, two of the AEWC communities have low levels (less than 10% of residents), while three communities have intermediate rates (10% - 18% of residents). The remaining six communities have higher rates, ranging from 23.7% through 52.7% of residents living below the poverty level. The available data suggests that population declines may be based on decreased economic activity for these communities. All but two of these communities exceed the average rate of Alaska residents living below the poverty level, which is 10.1%, and in many cases these rates are two and three times the Alaska average.

For the purposes of the environmental justice analysis, all of the AEWC communities qualify as predominantly minority, based on the high percentages of Alaska Native residents. The majority of these communities would qualify as having significant proportions of residents living below the poverty level, particularly when compared to the Alaska average.

4.10.6.2 Environmental Justice Effects Analysis

The analysis of environmental justice examines whether disproportionate, adverse human health or environmental impacts would affect minority and low income communities. As shown in Section 4.8.5.1, all of the AEWC communities affected by the proposed action would qualify as minority and in most cases low-income communities. For the purposes of this EIS, major impacts on bowhead whale populations or major impacts on subsistence whaling patterns would raise Environmental Justice concerns, as these would have a disproportionate adverse impact.

Under Alternative 1, no catch limit for subsistence bowhead whaling would be provided. As noted in Section 4.8.1, this would have major adverse direct, indirect, and cumulative effects upon the communities. Disruption of the bowhead harvest would eliminate a substantial food resource, disrupt cooperative labor and sharing practices, disrupt the learning process for young hunters, and disrupt highly valued cultural ceremonial events, particularly *Nalukatak*, the spring whaling festival. As a result of these disproportionately adverse effects, Alternative 1 would raise Environmental Justice concerns.

Alternatives 2, 3, and 4 would provide for an ongoing bowhead subsistence whaling quota, with variations in the provisions for carry-forward of unused strikes into subsequent years. Alternative 5 would provide for an ongoing bowhead subsistence whaling quota at increased harvest levels. Because these alternatives provide for continuity of subsistence whaling, the communities would not be affected by adverse direct or indirect effects. Concerning cumulative effects, **Section 4.6** concluded that none of the alternatives, when ongoing mitigation measures are taken into consideration, would result in major adverse impacts on the bowhead whale population. Therefore, Alternatives 2, 3, 4, and 5 would provide beneficial effects for the AEWC communities and do not raise environmental justice concerns that a minority population may be disproportionately adversely affected.

4.11 Summary of Effects

As presented in Chapter 2, “Alternatives, Including the Proposed Action,” five alternatives are analyzed in this FEIS. Under Alternative 1, NMFS would not issue the AEWC a subsistence whaling catch limit for cultural and nutritional purposes, notwithstanding the IWC Schedule’s requirement to establish catch limits and permit aboriginal subsistence whaling for Western Arctic bowhead whales, subject to certain limitations. This alternative would be contrary to the IWC Schedule, and because the WCA requires NMFS to implement requirements of the IWC Schedule, this alternative would also be contrary to U.S. law.

Under Alternative 2, NMFS would grant the AEWC the U.S. portion of an annual strike quota of 67 bowhead whales, not to exceed the U.S. portion of a total of 336 landed whales over any 6-year period. Under this alternative, no unused strikes from a previous year would be added to the strike quota for a subsequent year, notwithstanding the IWC's requirement to "carryover" or "carry forward" unused strikes in the bowhead subsistence catch limits. Because the IWC Schedule requires unused strikes to be carried forward and added to the strike quotas of subsequent years, subject to limits, this alternative would be contrary to the IWC Schedule. As the WCA requires NMFS to implement requirements of the IWC Schedule, this alternative would also be contrary to the WCA.

Under Alternative 3, NMFS would grant the AEWC the U.S. portion of an annual strike quota of 67 bowhead whales (plus up to 15 previously unused strikes as carry-forward), not to exceed the U.S. portion of a total of 336 landed whales over any 6-year period. This alternative differs from Alternatives 1 and 2 by allowing the AEWC to carry forward unused strikes from previous years, and add up to 15 of those unused strikes per year to the catch limits for any subsequent years, consistent with the current IWC Schedule. A carry-forward allows for variability in hunting conditions from one year to the next within limits that conserve the Western Arctic bowhead stock and is a long-standing feature of this quota structure.

Under Alternative 4, NMFS would grant the AEWC the U.S. portion of an annual strike quota of 67 bowhead whales (plus up to 33 previously unused strikes as carry-forward), not to exceed the U.S. portion of a total of 336 landed whales over any 6-year period. This alternative differs from Alternative 3 by allowing the AEWC to carry forward unused strikes from previous years, provided that no more than 50 percent of the annual strike limit is added for any one year, consistent with the IWC's 50 percent carryover principle. A carry-forward allows for variability in hunting conditions from one year to the next within limits that conserve the Western Arctic bowhead stock and, as noted, is a long-standing feature of this quota structure.

Under Alternative 5, NMFS would grant the AEWC the U.S. portion of an annual strike quota of 100 bowhead whales (plus carry-forward), not to exceed the U.S. portion of a total of 504 landed whales over any 6-year period. This alternative differs from Alternatives 1 through 4 by increasing the harvest levels by 50 percent, and differs from Alternatives 1 through 3 by employing the IWC's 50 percent carryover principle. A carry-forward allows for variability in hunting conditions from one year to the next within limits that conserve the Western Arctic bowhead stock and, as noted, is a long-standing feature of this quota structure.

The following tables (**Tables 4.11-1 through 4.11-3**) summarize the direct, indirect, and cumulative effects of each alternative for all resources where environmental consequences were evaluated and found to be possible. More detailed discussions of direct, indirect, and cumulative effects can be found in **Sections 4.4** through **Section 4.8.**

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Table 4.11-1
Summary of Direct, Indirect, and Cumulative Effects of the Alternatives and Other Activities in the Project Area on Bowhead Whales

Effect		Alternative 1 Do not grant AEWC a catch limit.	Alternative 2 Annual strike quota of 67 bowhead whales.	Alternative 3 Annual strike quota of 67 bowhead whales, plus up to 15 previously unused strikes as carry-forward.	Alternative 4 Annual strike quota of 67 bowhead whales, plus up to 33 (50% of annual strike quota) previously unused strikes as carry-forward.	Alternative 5 Annual strike quota of 100 bowhead whales, plus up to 50 (50% of annual strike quota) previously unused strikes as carry-forward.
Direct and Indirect Effects	**Mortality**	No direct or indirect effects of Alternative, as the Alternative would not contribute to mortality.	Negligible effects on mortality of Western Arctic bowhead whale population.	Same as Alternative 2.	Same as Alternative 2.	Minor adverse effects on mortality of Western Arctic bowhead whale population.
	Disturbance	No direct or indirect effects of Alternative, as the Alternative would not contribute to disturbance.	Minor effects of disturbance in magnitude, extent, and duration/frequency.	Same as Alternative 2.	Same as Alternative 2.	Same as Alternative 2.
Cumulative Effects		Cumulative effects to mortality would be negligible in magnitude, extent, and duration/frequency. Cumulative effects to	Cumulative effects due to mortality would be negligible in magnitude, extent, and duration/frequency. Cumulative effects to disturbance would be	Same as Alternative 2.	Same as Alternative 2.	Same as Alternative 2.

	disturbance would be negligible in magnitude, extent, and duration/frequency. A VLOS could have major adverse effects in terms of magnitude, extent, and duration/frequency if the spill occurred during a time when bowheads were present.	moderate in magnitude, extent, and duration/frequency. A VLOS could have major adverse effects in terms of magnitude, extent, and frequency if the spill occurred during a time when bowheads were present.			

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Table 4.11-2

Summary of Direct, Indirect, and Cumulative Effects of the Alternatives and Other Activities in the Project Area on Other Wildlife

Effect		Alternative 1 Do not grant AEWC a catch limit.	Alternative 2 Annual strike quota of 67 bowhead whales.	Alternative 3 Annual strike quota of 67 bowhead whales, plus up to 15 previously unused strikes as carry-forward.	Alternative 4 Annual strike quota of 67 bowhead whales, plus up to 33 (50% of annual strike quota) previously unused strikes as carry-forward.	Alternative 5 Annual strike quota of 100 bowhead whales, plus up to 50 (50% of annual strike quota) previously unused strikes as carry-forward.
Direct and Indirect Effects	**Mortality**	Minor to moderate effects in magnitude, extent, and duration/frequency.	Negligible to minor direct and indirect effects on mortality.	Same as Alternative 2.	Same as Alternative 2.	Same as Alternative 2.
	Disturbance	Minor to moderate effects in magnitude, extent, and duration/frequency.	Negligible to minor direct and indirect effects on disturbance.	Same as Alternative 2.	Same as Alternative 2.	Same as Alternative 2.
Cumulative Effects		Cumulative effects would be moderate for important game species (e.g. caribou) and minor for other species.	Negligible cumulative effects.	Same as Alternative 2.	Same as Alternative 2.	Same as Alternative 2.

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Table 4.11-3
Summary of Direct, Indirect, and Cumulative Effects of the Alternatives and Other Activities in the Project Area on the Sociocultural Environment

Effect		Alternative 1 Do not grant AEWC a catch limit.	Alternative 2 Annual strike quota of 67 bowhead whales.	Alternative 3 Annual strike quota of 67 bowhead whales, plus up to 15 previously unused strikes as carry-forward.	Alternative 4 Annual strike quota of 67 bowhead whales, plus up to 33 (50% of annual strike quota) previously unused strikes as carry-forward.	Alternative 5 Annual strike quota of 100 bowhead whales, plus up to 50 (50% of annual strike quota) previously unused strikes as carry-forward.
Direct and Indirect Effects	**Subsistence**	Adverse effects and major in magnitude, extent, and duration/frequency.	Beneficial effects and major in magnitude, extent, and duration/frequency.	Same as Alternative 2.	Same as Alternative 2.	Same as Alternative 2.
	Public Health and Safety	Adverse effects and major in magnitude, extent, but unknown duration/frequency. The effects on safety are complex, with positive net effects to hunter safety that count be countervailed by adverse nutritional, psychological, and social consequences.	Beneficial effects that are major for public health, but effects on safety would be adverse and minor due to the inherent risks of whaling.	Substantially similar to Alternative 2, but with additional temporal flexibility as a result of carry-forward that would increase the beneficial effects to public safety.	Substantially similar to Alternative 2, but with additional temporal flexibility as a result of carry-forward that would increase the beneficial effects to public safety.	Substantially similar to Alternative 2, but with additional temporal flexibility as a result of additional strikes and carry-forward that would increase the beneficial effects to public safety.

Cumulative Effects	Cumulative effects on subsistence practices, nutrition, and health would be adverse and major in magnitude, extent, and duration. Cumulative effects on public safety are unknown.	The contribution of Alternative 2 to the cumulative effects on subsistence harvest practices would be beneficial and major in magnitude, extent, and duration. Cumulative effects on subsistence harvest practices would be adverse and minor to moderate, depending on the timing and location of oil and gas activities, and the efficacy of measure intended to mitigate impacts. In the case of a VLOS, the cumulative effects on subsistence practices could be major in magnitude, extent, and duration, and could countervail any beneficial effects.	Same as Alternative 2.	Same as Alternative 2.	Same as Alternative 2.

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6.0 COOPERATION AND CONSULTATION

NEPA requires federal agencies to reduce delay in the NEPA process by cooperating with other affected agencies before an EA or EIS is prepared. Cooperative planning is encouraged when more than one agency (federal, state, tribal, or local) is involved in the project or program. Alaska Native subsistence hunting, include that taking of bowhead whales, is exempt from the Marine Mammal Protection Act and the ESA. However, consultation under Section 7 of the ESA is required.

NMFS consulted with the USFWS regarding potential effects of the bowhead subsistence harvests on ESA listed species, ESA candidate species, and designated critical habitat under USFWS jurisdiction. In the May 2018 consultation letter, the USFWS concluded that the proposed annual quotas for bowhead subsistence harvests are unlikely to adversely affect listed species or designated critical habitat under USFWS's jurisdiction (see **Appendix 8.4.1**).

NMFS consulted with itself regarding the potential effects of the bowhead subsistence harvests on ESA listed species, ESA candidate species, and designated critical habitat under NMFS jurisdiction. In its November 2018 biological opinion, NMFS reviewed potential impacts to seven species: bowhead whale; North Pacific right whale; fin whale; humpback whale, Western North Pacific Distinct Population Segment (DPS); humpback whale, Mexico DPS; bearded seal; and ringed seal (NMFS 2018; see transmittal letter in **Appendix 8.4.2**). NMFS concluded that the proposed action is not likely to jeopardize the continued existence of bowhead whales or North Pacific right whales.[33] NMFS does not expect any effects to designated North Pacific right whale critical habitat, which is located far outside the action area. While the Arctic ringed seal, Beringia DPS bearded seal, Mexico DPS humpback whale, Western North Pacific DPS humpback whale, and fin whale are expected to occur in the action area, NMFS concluded that they are unlikely to be adversely affected by the proposed action (NMFS 2018).

NMFS consulted with the AEWC during the scoping process and the development of alternatives. Additionally, although NMFS is the lead agency in this process and the agency with expertise on the biological aspects of bowhead whales, the AEWC was consulted about the social, economic, and cultural impacts of various alternatives. The AEWC also had an opportunity to comment on the Draft EIS document.

[33] As described in NMFS's Biological Opinion (NMFS 2018), NMFS and the AEWC will continue to work together to reduce potential adverse effects on North Pacific right whales that may occur in bowhead hunting areas, especially near St. Lawrence Island.

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8.0 APPENDICES

8.1 Description of Alaskan Eskimo Bowhead Whale Subsistence Sharing Practices Including an Overview of Bowhead Whale Harvesting and Community-Based Need: Final Report (2018)

Description of Alaskan Eskimo Bowhead Whale Subsistence Sharing Practices

Including an Overview of Bowhead Whale Harvesting and Community-Based Need

Final Report

Submitted to

Alaska Eskimo Whaling Commission

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Acknowledgements

We would like to thank the 67 whaling captains, co-captains, and crew members, in addition to other community members, who provided their time and knowledge in support of this research. Multiple individuals and entities provided financial, technical, and logistical support for this study. The research was conceived by the Alaska Eskimo Whaling Commission (AEWC) and funded by the AEWC, the North Slope Borough (NSB), and the National Oceanic and Atmospheric Administration (NOAA). We would like to thank the 11 AEWC commissioners for their support and guidance, particularly during the study's initial development and during subsequent reviews. We would also like to thank Lesley Hopson, Administrative Manager of the AEWC, for her prompt logistical support; and Arnold Brower, Jr., Executive Director of the AEWC, for his oversight and advice. Robert Suydam and Craig George of the NSB Department of Wildlife Management shared key data and insight, as did Michael Galginaitis of Applied Sociocultural Research. Fieldwork in the seven study communities would not have been possible without the assistance and support of the AEWC commissioners, Whaling Captains Association presidents, and other individuals and entities in each community. In particular, we would like to thank Edmond Apassingok and Rodney Unwiluk of Gambell; Thomas Akeya, George Noongwook, and Larry Kava of Savoonga; Clark Lane and Herbert Kinneeveauk of Point Hope; Chester Ekak and John Hopson, Jr. of Wainwright; Arnold Brower, Jr. and Eugene Brower of Utqiaġvik; Carl Brower and Thomas Napageak, Jr. of Nuiqsut; and Christopher Gordon of Kaktovik.

We would also like to acknowledge Jessica Lefevre, AEWC Legal Counsel, who was instrumental in getting this study off the ground; providing valuable insight regarding study methods, analyses, and conclusions; and providing technical assistance and editing throughout the life of the project.

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List of Acronyms

ADF&G	Alaska Department of Fish and Game
ADOLWD	Alaska Department of Labor and Workforce Development
AEWC	Alaska Eskimo Whaling Commission
BOEM	Bureau of Ocean Energy Management
CSIS	Community Subsistence Information System
IHLC	Iñupiat Heritage and Language Center
IWC	International Whaling Commission
NOAA	National Oceanic and Atmospheric Administration
NSB	North Slope Borough
SRB&A	Stephen R. Braund & Associates
USDOI	United States Department of the Interior

Introduction

Stephen R. Braund & Associates (SRB&A) was contracted by the Alaska Eskimo Whaling Commission (AEWC) to conduct research on the sharing of bowhead whales by Alaska Eskimo whaling communities (Iñupiaq and Siberian Yupik) to non-whaling communities and explore whether the current quota system allows for adequate harvesting opportunities for Alaska Eskimo whaling communities, given any new information related to bowhead whale sharing practices. SRB&A's research included a review and analysis of existing literature related to bowhead sharing outside of whaling communities, in addition to interviews and workshops with whaling captains and crew members in seven of the 11 Alaska Eskimo whaling communities. This report describes the results of SRB&A's research over the two phases of the study (January through June 2016 and July 2016 through June 2017).

Purpose and Need

In 2015, the AEWC asked SRB&A to submit a proposal to conduct research on the sharing and distribution of bowhead whale by Alaska Eskimo whaling communities to non-whaling communities. AEWC members had expressed concerns that current and past methods for quantifying the need of Alaska Eskimo whaling communities for bowhead whale do not adequately take into account sharing, because quantification methods are based solely on Alaska Eskimo populations living in whaling communities. Since these quantification methods were developed, social science research has begun to reveal the long-standing subsistence sharing networks that form the backbone of the northern Alaskan mixed subsistence-cash economy. Through these interlocking village networks, food items, including bowhead whale, are shared among northern Alaskan communities and with relatives living in other areas. Thus, it is becoming clear that any analysis of subsistence need for bowhead whales must take account of subsistence sharing practices.

In addition to the failure to account for subsistence sharing beyond individual whaling communities, existing quantification methods rely on incomplete historic data from harvests that occurred at a time when 1) both Alaska Eskimo and bowhead whale populations were at a reduced level associated with Yankee whaling, and 2) sharing outside of the whaling communities was limited due to limited transportation opportunities, and the sharing that did occur was not well documented.

Substantial changes in demographics, communication, and access to transportation, in the years since the current method for quantifying Alaskan Eskimo need for bowhead whales was adopted by the International Whaling Commission (IWC) in 1986, are associated with expanded need and opportunities for customary sharing beyond individual villages. In addition, recent social science research focused specifically on sharing of subsistence foods (Kofinas et al. 2016) is beginning to reveal the central role of sharing, including bowhead whale, in the lifeblood of the northern Alaskan subsistence economy. Finally, the current quota method relies on per capita need based on a 1910 to 1969 base period, a time period that ended nearly 50 years ago.

In short, the methods used to quantify need for bowhead whales by Alaska Eskimo whaling communities were developed in the 1980s, were based on sometimes limited historic data from 1910 to 1969, and the demographics of Alaska Eskimos, in flux at the time of the original study, have continued to change since that time. In addition, quantification methods never took into account the sharing of bowhead whales, a central aspect of the northern Alaskan bowhead whale culture. Finally, during the course of this research, the study team identified several additional factors that affect whaling success and community need, which were not addressed in the original quantification statement. Thus, the purpose of this research is to characterize sharing of bowhead whale outside communities, as currently understood; to indicate current levels and patterns of bowhead whale subsistence sharing; to determine why and how sharing opportunities are currently limited; to identify issues related to the current quantification methods which may affect whaling success and community need; and to reevaluate current need based on the above factors.

Methods

Literature Review

SRB&A conducted a literature review of existing sources of data on the harvest and sharing of bowhead whales by Alaska Eskimo whaling communities. The purpose of the literature review was to identify existing qualitative information on the role of bowhead whales and sharing in Alaska Eskimo whaling communities in addition to quantitative and qualitative information on the sharing and distribution of bowhead whales through kinship and social ties with Alaska Natives residing outside the whaling communities. Numerous sources were identified which characterize the methods for distributing bowhead whale throughout a community, and the importance of the act of sharing as part of the bowhead whaling complex. Fewer sources quantify the frequency of sharing or amount shared, or they only characterize sharing within community sharing networks (i.e., not outside the community). However, recent work in this area is beginning to reveal long-standing, but previously unreported, patterns of social interaction tied to the sharing of subsistence foods, including bowhead whale.

The study team reviewed early documents associated with the development of the current bowhead whaling quota, including *Subsistence Study of Alaska Eskimo Whaling Villages* (Alaska Consultants, Inc. and SRB&A 1984), *Quantification of Subsistence and Cultural Need for Bowhead Whales by Alaska Eskimos* (Braund et al. 1988) as well as Tillman (1980), United States Department of the Interior (USDOI) (1980), and U.S. Government (1983). In addition, the study team reviewed agency or government sources of data on bowhead whaling and sharing, including the North Slope Borough (NSB) census (Shepro et al. 2011), Alaska Department of Fish and Game subsistence harvest surveys (ADF&G 2016); and research funded by the Bureau of Ocean Energy Management (BOEM) regarding the potential impacts of offshore oil and gas activities on bowhead whale hunting (Downs et al. 2008). A more recent research paper by Kishigami (2013a) provides both quantitative and qualitative data on distribution of bowhead whale but with a focus on distribution throughout the community of Utqiaġvik (formerly Barrow).

In order to provide context regarding the role of sharing and bowhead in Alaska Eskimo cultures, SRB&A reviewed oral histories, ethnographic data, governmental reports, academic articles, books, and websites. Other sources on Alaska Eskimo whaling and distribution include archeological/prehistoric evidence of whaling (Mason 2009; Sheehan 1992, Larsen and Rainey 1948), ethnographic studies and oral histories (Bodenhorn 1988, 2000a, 2000b; Hess 2003; Jolles 1995, 2003; NSB 2016a; Spencer 1959), various journal articles (Fair 2000; Ikuta 2007; Turner 1993), and postgraduate research (Okada 2010; Kofinas et al. 2016; Baggio et al. 2016; BurnSilver et al. 2016).

Fieldwork

During the two field phases of this research project, SRB&A conducted key informant workshops and interviews with whaling captains and crew members in seven Alaska Eskimo whaling communities: Utqiaġvik, Nuiqsut, Kaktovik, Gambell, Savoonga, Point Hope, and Wainwright. The study included these communities because in recent years they have constituted the bulk of bowhead whale harvests. The remaining four Alaska Eskimo whaling communities—Kivalina, Little Diomede, Wales, and Point Lay—have either not had ice and weather conditions conducive to whaling or, in the case of Point Lay, only recently received a quota from the AEWC (Table 1). Bowhead whale continues to be central to the culture

Table 1: AEWC Bowhead Whale Harvests, 2000-2016

Year	Gambell	Savoonga	Wales	Little Diomede	Kivalina	Point Hope	Point Lay	Wainwright	Utqiaġvik	Nuiqsut	Kaktovik	Landed Total
2000	0	1	1	0	0	3	-	5	18	4	3	35
2001	2	3	0	0	0	4	-	6	27	3	4	49
2002	2	5	0	0	0	0	-	1	22	4	3	37
2003	1	2	0	0	0	4	-	5	16	4	3	35
2004	3	0	0	0	0	3	-	4	21	3	3	37
2005	2	7	1	1	0	7	-	4	29	1	3	55
2006	0	0	0	0	0	0	-	2	22	4	3	31
2007	4	4	0	0	0	3	-	4	20	3	3	41
2008	2	4	0	0	0	2	0	2	21	4	3	38
2009	1	3	0	0	0	1	1	1	19	2	3	31
2010	6	5	0	0	0	2	0	3	22	4	3	45
2011	4	2	0	0	0	3	1	4	18	3	3	38
2012	5	8	1	0	0	5	1	4	24	4	3	55
2013	2	6	0	0	0	6	0	3	22	4	3	46
2014		3	0	0	0	6	0	3	17	5	3	37
2015	1	1	0	0	0	3	0	3	24	2	4	38
2016	1	2	0	0	0	7	1	7	22	4	3	47
Total	36	56	3	1	0	59	4	61	364	58	53	695
Source: AEWC 2016b												

of these four communities, and while harvests have been somewhat limited in recent years, they continue to receive bowhead whale from other whaling communities, often join whaling crews in other nearby whaling communities, and likely share whale they receive outside their communities as well. However, for the purposes of this study, researchers focused on the seven communities that currently harvest whales on an annual basis and are the main source of primary bowhead whale distribution among Alaska Natives residing outside the 11 subsistence whaling communities.

During the first phase of the study, which included fieldwork in Utqiaġvik, Nuiqsut, and Kaktovik, the study team developed interview questions to guide each interview, which were revised after an initial trip to Utqiaġvik based on feedback and input from whaling captains. The purpose of the interviews and workshops was to gather data on where whaling captains and crew members share bowhead whale products, with whom they share these products, and how much they share in a given year. Each interview also included questions comparing the most recent whaling season to previous years (in term of shares received and distributed) and general questions regarding current bowhead quotas. During the second phase of the study, which included fieldwork in Gambell, Savoonga, Wainwright, and Point Hope, the study team reviewed and revised the Phase 1 interview protocol based on what it found to be the key research questions and findings of Phase 1. While Phase 2 fieldwork also focused on whaling captains and crew members, the study team chose to use workshops as its primary method of data collection. Researchers found that while the individual interviews conducted during the first year of the study provided valuable input and data, they were not adequate for developing estimates of sharing quantities for the community as a whole, because they were not conducted with a statistical sample of community residents. Because a community-wide survey was not feasible for this study, the study team chose to focus on qualitative and consensus-based information from those most familiar with the topic of bowhead sharing—whaling captains. These workshops were more conducive to documenting consensus views by Alaska Eskimo whaling communities regarding bowhead whale sharing and community need. In addition, the study team found that holding workshops resulted in higher participation rates among whaling captains and crew members. Additional key informant interviews were conducted as necessary for additional context and input.

SRB&A chose to focus the interviews and workshops on whaling captains and/or crew members because they are the primary sources of sharing and distribution of bowhead whale within and outside a whaling community. In general, captains and crew members receive shares of bowhead whale from their participation in whaling and then distribute these shares to the rest of the community or to others outside the community, with whom they share kinship or social ties. In addition, the captain is responsible for distributing a large portion of each whale at *Nalukataq, Qagruk* (in Point Hope), and other feasts such as at Thanksgiving and Christmas. Additional secondary or tertiary sharing occurs among community members who receive bowhead from crew members or at community feasts and subsequently share meat and *maktak* with family and friends within and outside their community. However, because this study did not aim to conduct surveys with a statistical sample to estimate community-wide quantities and frequencies of sharing outside whaling communities, the focus of the interviews and workshops was on the individuals in each community who receive the greatest portion of shares and therefore are most likely to distribute a greater portion of meat and *maktak* with family and friends in non-whaling communities.

SRB&A coordinated with the president of the whaling captain's associations in each community to arrange workshops and interviews with whaling captains. In addition, when whaling captains provided the names and numbers of co-captains or crew members, these individuals were also contacted. Interviews and workshops took place in person and, in some cases, over the phone, and responses were recorded on a laptop. During Phase 1 of the study (Utqiaġvik, Nuiqsut, and Kaktovik), the study team conducted interviews with 21 whaling captains, two co-captains, and three crew members in the three study communities. During Phase 2 of the study (Gambell, Savoonga, Wainwright, and Point Hope), the study team conducted four workshops, one in each of the four communities, attended by a total of 41 whaling captains and crew members. Several additional key informant interviews were also held in these communities. Because the study team did not attempt to interview a statistically representative sample and focused on one subset of the population (whaling captains and crew members), the data provided in this report should not be considered statistically representative of the community as a whole.

Analysis and Reporting

SRB&A used a combination of qualitative and quantitative methods of analysis for this report. In addition to analyzing the whaling captain and crew interview data, the study team compiled and analyzed data from existing sources (e.g., NSB census, ADF&G harvest surveys, 1980s whaling survey) on sharing, in addition to population data (U.S. Census) and data on Alaska Native population trends.

Results

Definition of Subsistence

Subsistence is central to Alaska Eskimo culture and life and is the cornerstone of the traditional relationship of the Iñupiaq and Siberian Yup'ik people with their environment. Alaska Eskimos rely on subsistence harvests of plant and animal resources for nutritional sustenance and cultural and social well-being. Subsistence is not simply a source of food for Alaska Eskimos, but the activities associated with subsistence strengthen community and family social ties; reinforce community and individual cultural identity; and provide a link between contemporary Alaska Eskimos and their ancestors. Subsistence customs and traditions encompass processing, sharing, redistribution networks, and cooperative and individual hunting, fishing, gathering, and ceremonial activities. These activities are guided by traditional knowledge based on a long-standing relationship with the environment. Both federal and state regulations define subsistence uses to include the customary and traditional uses of wild renewable resources for food, shelter, fuel, clothing, and other uses (ANILCA, Title VIII, Section 803, and AS 16.05.940[33]). The Alaska Eskimo view of subsistence goes beyond the basic definition of hunting, fishing, and gathering of wild resources, but also asserts the harvest of natural resources is crucial to their physical and cultural survival. A recent U.S Army Corps of Engineers study conducted a literature review of existing subsistence definitions and provided a proposed definition of subsistence, which addressed the economic, social, cultural, and nutritional elements and components of subsistence that have not been emphasized in previous definitions. This definition reads as follows:

> *"Subsistence refers to a way of life in which wild renewable resources are obtained, processed, and distributed for household and communal consumption according to prescribed social and cultural systems and values.*
>
> *The harvest, distribution, and consumption of subsistence resources are governed by technology, infrastructure, cognitive mindsets, and traditional knowledge. These resources may be used as food, shelter, fuel, clothing, tools, or transportation; for the making and selling of handicraft articles out of nonedible plants and byproducts of fish and wildlife resources; for barter, or sharing for personal or family consumption; for customary trade; and for celebrations and ceremonies.*
>
> *Subsistence activities are primarily organized through kin relations, special roles, and communal values within and among specific communities. These communal values emphasize reciprocity between individual community members and the community as*

a whole through sharing and with respect for the environment and relations with non-human species. Subsistence activities are reproduced across generations through both formal and informal training of descendants in the concepts, behaviors, values, and skills necessary to successfully sustain the community and the resources upon which they depend.

The subsistence way of life satisfies to various degrees and in various contexts, the economic, social, cultural, and nutritional needs of subsistence based communities." (ResourceEcon et al. 2011)

History/Overview of the Harvest of Bowhead Whales by Alaska Eskimos and Documentation of Community-Based Need

The following is a brief history and overview of bowhead whaling by Alaska Eskimos through present day, and a summary of past efforts to document community-based need over time. More in-depth descriptions of the pre-historic and historic whaling periods and community-specific information are available through various sources, including Durham (1979); Alaska Consultants, Inc. and SRB&A (1984); SRB&A (2010); Bockstoce (1986), Braund et al. (1988); Burch (1988); Downs et al. (2008); Kishigami (2013a, 2013b); Galginaitis (2014); and Worl (1980).

Prior to IWC Involvement (Pre - 1977)

Archaeological evidence for ancestral whaling is first evident approximately 1,700 years ago on St. Lawrence Island, Diomede Islands, the eastern coast of the Bering Sea, and the North Slope of Alaska (Larsen and Rainey 1948; Mason 2009). Archaeological evidence and historical accounts show ancestral Iñupiat and Siberian (Saint Lawrence) Yupik continued whaling from the onset around 1,700 years ago through contact with Europeans (Mason 2009:76-77). Direct archaeological evidence for whale hunting consists of harpoon heads too large for other marine mammals and depictions of whale hunting in prehistoric art (McCartney 1980:521-524, NSB 2016a). Contemporary Iñupiat have harvested bowheads with stone harpoon heads still in them (NSB 2016a). The presence of *umiaks* and *angyapiks* (skin boats used in whaling), drag floats, and other marine technology found in archaeological sites provide indirect evidence of whaling as they could have been used for whaling or other marine mammal harvesting activities (McCartney 1980:525-526). In addition, archaeological sites demonstrate that ancestral Iñupiat and Siberian Yupik were dependent on whale for food, oil for lamps, housing and cache construction, transportation parts, household items, and tools (McCartney 1980:530 Table 2).

In general, whaling occurred when Eskimo populations were high enough to support whaling crews, and cooperative hunting intensified in the 16th century when climactic changes brought increased nearshore ice and facilitated access to whaling grounds (Alaska Consultants, Inc. and SRB&A 1984). By the 19th century, several large whaling villages (Gambell on St. Lawrence Island, Wales, Point Hope, and Utqiaġvik) had developed in the western Arctic and whaling traditions had become central to their culture (Alaska Consultants, Inc. and SRB&A 1984; Braund and Moorehead 1995).

With European contact came great changes to the whaling villages of Alaska. While some limited contact with Alaska Eskimos in the central and northwestern Arctic began as early as the 1700s, continuous European contact did not occur until the mid-19th century, when commercial harvests of bowhead whales took hold amidst an abundance of animals and a market for whale oil and baleen. Numerous whaling stations were established along the western Arctic coast to Point Barrow, and Alaska Eskimo whalers were employed on whaling boats. Commercial whaling continued throughout the latter half of the century and resulted in dramatic social and demographic changes for Alaska Eskimos in addition to the near depletion of the bowhead whale stock.

Alaska Eskimos continued subsistence whaling after the collapse of the whaling industry by 1910, albeit with new technologies adopted from the commercial whaling period (Alaska Consultants, Inc. and SRB&A 1984; SRB&A et al. 1988). The IWC was established in 1946 under the International Convention for the Regulation of Whaling. Until the 1970s, the IWC was primarily concerned with the management of commercial whaling, and Alaska Eskimo subsistence whaling was exempt from regulation. However, concerns about bowhead whale numbers in addition to increasing reports of struck and lost whales in the 1970s led the IWC in 1977 to delete the exemption for the bowhead whale subsistence harvest and to impose a zero quota for the 1978 season (Braund and Moorehead 1995).

Establishment of the AEWC and Quantification of Need

The AEWC was established by Alaska Eskimo whalers in 1977 in direct response to the actions taken by the IWC effectively to ban the harvest of bowhead whales by Alaska Eskimos. Since that time, the AEWC has been the primary organization representing the needs and interests of Alaska Eskimo whalers in the communities of Gambell, Savoonga, Wales, Diomede, Kivalina, Point Hope, Point Lay, Wainwright, Utqiaġvik, Nuiqsut, and Kaktovik.

At a special meeting in December 1977, the U.S. government proposed a limited hunt for the 1978 season, and the IWC agreed (Braund and Moorehead 1995). Around the same time, the IWC passed a resolution calling for further research on the cultural and nutritional needs of Alaska Eskimos to hunt bowhead whales (Alaska Consultants, Inc. and Stephen R. Braund & Associates 1984, Braund 1992). The USDOI oversaw that research, which included the support and participation of the AEWC. A 1982-1983 survey in nine whaling communities documented and established the cultural importance of bowhead whales to Alaska Eskimos (*Subsistence Study of Alaska Eskimo Whaling Villages* [Alaska Consultants, Inc. and SRB&A 1984]); however, it did not quantify the number of bowhead whales necessary to fulfill that need. Subsequent research was conducted to develop a method to quantify the subsistence and cultural need for bowhead whales (USDOI 1980, U.S. Government 1983), and the resulting method was further developed and refined in *Quantification of Subsistence and Cultural Need for Bowhead Whales by Alaska Eskimos* (Braund et al. 1988). The method developed in these reports was accepted by the IWC, resulting in a quota of 41 landed bowhead whales in 1988, and this method has been used in subsequent years to update the quota. While the IWC granted an overall quota for Alaska Eskimo whaling communities, it was left to the AEWC to decide how to divide that quota among individual communities.

The method and documentation accepted in 1988 to quantify Alaska Eskimo need for bowhead whales was based on 1) historic bowhead harvest levels (for a "base period" of 1910-1969), and 2) Eskimo populations in whaling communities. Using historic harvest levels and Eskimo populations during the base period, the 1988 report established a per capita need for bowhead whales for each whaling community. Applying this method, determination of current need for bowhead whales, per capita harvests, by village, are multiplied by current Alaska Eskimo populations per village (as documented by the U.S. Census Bureau). Thus, the quantification of need takes into account only the population size within each whaling village. After being applied initially in 1988 (Braund et al. 1988), the method for quantifying need was used to update need, based on the population size of the AEWC villages in 1991, 1994, 1997, 2002, 2007, and 2012 (SRB&A 1992, 1994, 1997, 2002, 2007, and 2012).

1989 through Present

Today, harvests of bowhead whales by Alaska Eskimos are regulated by the IWC and managed locally through a cooperative agreement between the AEWC and the National Oceanic and Atmospheric Administration (NOAA), within the U.S. Department of Commerce (AEWC 2016a). AEWC representatives have attended every IWC meeting since 1977 and work cooperatively with the NSB and NOAA to conduct research on bowhead whale stocks in addition to developing whaling technologies to ensure efficient and humane harvests. In 2015, a total of 155 whaling captains from the 11 subsistence whaling communities, were registered with the AEWC, indicating the continued importance and prevalence of whaling in Alaska Eskimo society (AEWC 2016b). As discussed in following sections, bowhead whaling has remained key to the social, cultural, economic, and nutritional needs of these communities.

Documentation of Community-Based Need Over Time

There have been eight calculations of subsistence and cultural need for bowhead whales by Alaska Eskimos. The first calculation of subsistence and cultural need submitted to the IWC (see above) was undertaken in 1983 (U.S. Government 1983). The second calculation was submitted to the IWC in 1988 (Braund, Stoker and Kruse 1988) when more extensive research provided additional historical whaling and human population data. The 1988 study used the most recent Eskimo population data available at that time, ranging from 1983 to 1987, to calculate current need. The third calculation of need, performed in 1992, was based on 1990 U.S. Census population data. This update was presented to the Alaska Eskimo Whaling Commission (AEWC), but not to the IWC (SRB&A 1992). The fourth calculation of need was conducted in 1994 based on July 1, 1992 population data generated by the State of Alaska, Department of Labor (SRB&A 1994). The fifth calculation (fourth presented to the IWC) was based on July 1, 1997 population data generated by the State of Alaska, Department of Labor (SRB&A 1997). The sixth calculation of need conducted in 2002 (SRB&A 2002) and the seventh calculation of need conducted in 2007 (SRB&A 2007) relied on 2000 U.S. Census data. A 2012 report, which used 2010 U.S. Census data, was the fourth time since 1983 that U.S. Census data had been used for the Alaska Eskimo needs calculation. All of the calculations of need since 1988 have utilized the same method that was accepted by the IWC in 1988.

Overview of Sharing of Bowhead Whale in Alaska Eskimo Communities

The quantification methods described above document the accepted method within the IWC of addressing subsistence and cultural need on based on limited historic data and focusing only on two variables: current populations of Alaska Eskimos and historic harvest levels. Thus "need" in subsistence harvests is reduced to a per-capita harvest quota derived in a manner that is divorced from the social and psychological qualities that imbue the cultural experience of the subsistence harvest of whales. In the subsistence context, the experience of "need" is qualitative as well as quantitative. Inarguably a certain quantity of food is needed to sustain physical existence. Uniquely, however, in Inupiat and Siberian Yup'ik communities the opportunity to harvest and the practices and experiences associated with harvesting and sharing the food that provides those calories and nutrients is as crucial to survival as the food itself.

This section provides an overview of the role of bowhead whale and sharing in Alaska Eskimo society, in addition to the general methods of distributing bowhead within and outside whaling communities. For detailed information on whaling methods, bowhead harvests, use areas, and the seasonal cycle of whaling, see, for example, Alaska Consultants, Inc. and SRB&A (1984); Braund et al. (1988); Burch (1988); Nelson (1969, 1981); Downs et al. (2008); Hess (2003); Rainey (1947); Kishigami (2013a, 2013b); Galginaitis' summary reports (2014; 2009); SRB&A (2010); Suydam and George (n.d.); SRB&A and ISER (1993a, 1993b); and Braund and Moorehead (1995).

The Role of Bowhead Whale and Sharing in Alaska Eskimo Society

The purpose of this discussion is to provide background and context for bowhead sharing through kin and social networks extending beyond the whaling communities themselves. This section explores the role of bowhead and sharing in the lives of ancestral and present day Iñupiaq and Siberian Yupik people, as evident through oral histories, customary practices, and language. Oral histories provide an avenue for explaining why sharing and bowhead are central to the Iñupiaq and Siberian Yupik cultures, customary practices illustrate how sharing of bowhead occurs, and the Iñupiaq and Siberian Yupik languages offer insight into the interconnectedness of bowhead and sharing linguistically.

Sharing is central to the Iñupiaq world view, and one of the core values of Iñupiaq and Yup'ik Eskimo culture and society (Alaska Native Knowledge Network 2016). Sharing, in this society, serves to maintain and strengthen social ties within and across communities. As Bodenhorn (2000a) describes it, sharing in Iñupiaq society is "a complex of social actions all of which create and maintain morally valued relations that extend well beyond hunting itself.... Sharing both maintains social networks among humans and fulfills the social contract between humans and animals." As such, sharing is a central tenant of Alaska Eskimo (Iñupiaq and Siberian Yupik) whaling culture.

Whaling itself is a cooperative effort that requires the participation of entire communities; nearly everyone, regardless of age or sex, has a role and therefore shares something of themselves – whether it be supplies, food, knowledge and expertise, generosity, money, or time – in order to ensure a successful harvest during that and future whaling seasons. For example, while the crew in the whaling boat may be primarily made up of male hunters, women and other individuals are also crew members and are central to the bowhead whale hunt. The captain's wife is believed to attract bowhead whales if she is "generous and skillful" (Bodenhorn 1990). Specific skills that women contribute to the bowhead whale hunt include sewing of skins and clothing, preparation of food for whaling crews and visitors, and assistance with the distribution of whale throughout the community (Bodenhorn 1990). Elders are often members of whaling crews and provide advice and knowledge based on a lifetime of whaling experience, even if they are no longer able to join crews on the ice or water. Members of the younger generation often serve on crews as "boyers," where they do not actively hunt but assist with errands and other tasks to support crews from the shore and learn by observation. Finally, other community members assist by providing financial or other means of provision and by assisting with butchering and distributing the whale. Thus, the entire bowhead whale hunt is centered on sharing – not only of food, but of one's knowledge, skills, possessions, and time.

To a whaling captain, sharing is not about choice, but about a cultural and spiritual obligation to their community. In fact, the bowhead whale is seen as giving itself to the hunter with the expectation that it will be shared to the community as a whole. Ernie Frankson, a Point Hope whaling captain, recounted the following Iñupiaq story, wherein an *aŋatkuq* 'shaman' traveled with the bowhead to learn their ways, including how to identify the proper hunters to whom to give themselves (Hess 2003). According to the story, worthy hunters had clean umiaks, which demonstrated they respected animals and shared with others:

> *Once there lived a man by the name Katauq, an* anatkuq *[emphasis in original], or what the English-speaking world calls a shaman. One day, as Katauq rested inside his sod iglu (sic), others gathered there noticed that he sat perfectly still, not moving a muscle. He did not blink, nor move his head. He was breathing, and that was it. This did not worry them, for they knew that he had gone traveling. They would just let him be until his spirit returned to his body.*
>
> *The spirit of Katauq traveled far, finally arriving at a great gathering of bowhead whales. They gave him a parka. When Katauq put it on, he took on the appearance of a whale, although his mind remained that of a man. Katauq spent the winter with the bowheads, living and eating as they did. He learned their habits and came to understand their ways.*

> *As spring neared, the bowheads prepared for their journey north and east, when they would travel from what is now called the Bering Sea through the Bering Strait, into the Chukchi Sea and finally the Beaufort Sea. Along the way, the bowheads told Katauq, they would meet hunters waiting with the* umiaks *[emphasis in original], their skin-covered boats. Some of the boats would appear light and clean, pleasing to the eye; others would be dark and dirty. If Katauq wished to give himself to a whaling crew, he must surface by a clean umiak. These belonged to respectful people; people who were considerate of others, who* ***shared*** *[emphasis added] their catch with widows, orphans, the old, and all those who could not hunt for themselves. They were honest. They treated other people, and all animals, with respect.*

Murdoch (1891:272) made a similar observation in Utqiaġvik in 1883 noting that "Every article to be used in whaling-harpoons, lances, paddles, and even the timbers of the boats-must be scraped perfectly clean," and Egede (1818:72) noted that when the Greenlanders go "whale catching, they put on their best gear or apparel, as if they were going to a wedding feast, fancying that if they did not come cleanly and neatly dressed, the whale, who cannot bear slovenly and dirty habits, would shun them and fly from them."

During discussions with the study team, whaling captains discussed the obligation of a whaling captain to share what they have, indicating that a whaling captain can never decline a request for bowhead if they are able to provide:

> *People [other Natives] always ask [for bowhead]. When I go to Fairbanks, Nenana, Delta, they are always asking. I give them some whenever I have some. [They say], 'We never had some for a long time,' and I end up giving them some . . . when they ask for it, it is something a captain or whalers cannot say no to. It is very hard to say no to anybody, particularly when they live in the cities and cannot go out to hunt. And when they receive it, they are happy.* (Nuiqsut Whaling Captain Interview May 2016)

> *Respondent 1: There's others that will straight up ask you, 'Do you have any maktak to share?' If we have extra, there it goes. Nothing in return.*
> *Respondent 2: All you get [in return] is a happy smile, . . . when you see a tear come down their eye, that's how happy they are to get it.* (Wainwright Whaling Captains Association Meeting March 2017)

As noted above, the Alaska Eskimo concept of sharing is more than giving something or enjoying something jointly with another person. Based on her ethnographic research on Iñupiaq sharing, Bodenhorn (1988:83) describes the Iñupiaq concept of sharing beginning with the relationship between animal and hunter. The animal shares itself with the hunter, and the hunters' families share the meat so the animal will want to share themselves again. The sharing relationship between animal and hunter is a "spiritual action" for the Iñupiat, which distinguishes it from the Western concept of sharing as a purely economic pursuit or aspect of social dynamics. Sharing is not just limited to subsistence foods. For example, in addition to the animal-hunter relationship, there is an Alaska Eskimo "obligation" to share knowledge with others, particularly younger generations. Furthermore, in contrast to Western concepts of adoption, child adoption in Alaska Eskimo society is seen as a form of sharing that "reaffirms the connection between families" and expands parental ties (Bodenhorn 1988:83-84). Finally, sharing is central to social gatherings such as family get-togethers and community events, and the sharing of money, time, labor, equipment, other goods, a place to stay, or storage space also occurs in association with these events. As a part of her ethnographic research, Bodenhorn (2000a) worked closely with Raymond Sr. and

Marie Neakok, an Utqiaġvik whaling family. In the following quote, Bodenhorn (2000a:27), documents a discussion between Raymond and a niece that succinctly explains the Iñupiaq concept of sharing:

> *I listened to Raymond Neakok, Sr., a Barrow whaler, explain to a niece what* tutqiksi- *generally translated as contentment-meant to him. It expresses a 'sense of satisfaction' and 'peace of mind', he said, which is created and nurtured by hunting and providing others with food through sharing; it communicates a feeling of freedom, joy, and pride in being successful in this way; and it may be renewed when, even years later, someone comes up to you and says, 'thanks, remember when ...' It lasts only a few moments before you must go back out and do it all over again. The feeling must be constantly renewed – through hunting and through sharing – in order to be maintained.*

Similarly, a Siberian Yupik whaling captain summarized the interconnectedness of sharing and whaling this way:

> *Even if you are not the one who gets the whale you are happy. When it is time to get your share and they call your name, you get your share and then you take it home and you share it with your crew and your family. Just like any society, you provide for your family and community. ... If you cannot whale or you do not get a whale, then you do not feel like a total person and you are not happy. There is no happiness. There are certain realms to a good life. There is the spiritual side. There is the cultural side and the economic side, feeding your family, crew, and the whole community.* (Downs et al. 2008:4-144)

The ethics and values associated with bowhead whaling are so deeply ingrained in Alaska Eskimo culture that they pervade other aspects of life and remain stable amidst social and economic change. During interviews for this research, an Iñupiaq whaling captain described the cultural and communal importance of bowhead and how it ties people to their community, even as technologies have changed and community members have moved away:

> *The whale being the center of our culture, it was the one animal that no one person can catch on their own, unlike any other animal or mammal where folks can catch alone. It took cooperation; it took teamwork. It brought people together, and it provided provision, sustenance for a long period of time, over a course of a year and beyond. Being able to put [whale] in an ice cellar, one could feed on that for years. It was the main center of our culture, not only [in] how we survived, but thrived in our region. Other caribou, walrus, fish, polar bear were important, but the whale was the center of our culture.*
>
> *...* ***The role of the whaling captain has not changed. The ways and means might have changed. Our technology might be advanced, but the spirit of sharing, feeding, providing has not changed; that is a continuum.*** *(Emphasis added.) In this day and age when [we are] no longer traveling by boat or dog team or whatever, the ways and means have changed. Airplanes flying thousands of miles. Our people moved. People re-located to different parts of the state and beyond, [but] they still have their connection to their home.* (Utqiaġvik Whaling Captain Interview March 2016)

The role of a whaling captain does not end when the whaling season ends and is not limited to the harvest, processing, and distribution (or sharing) of a bowhead whale. Instead, a whaling captain's duties extend beyond the whaling boat and community feasts to positions in government, business, and community organizations. Whaling captains – especially successful ones – are considered leaders in all facets of community life. One whaling captain in Utqiaġvik described how integrated whaling culture is with the governments and corporations of the North Slope:

> *In the areas of the responsibility of the captain – when you take the role of the whaling captain and the wife, it is a huge responsibility of becoming a captain and leader in your community, it is applied universally. It is applied not just in the cultural sense. It is applied in government, and it is applied in business. It is applied in everything that we do in life. When people look for leadership in the community, it is the captains they look for leadership from, because they are the most knowledgeable and most experienced. Because no one person can do what we do and go out and harvest whales. It takes cohesive work, collaboration, communication.* ***The role of the whaling captain has not changed from time immemorial. He was not just a hunter looking out for himself. He was a leader in the community who looked out for the community.*** *(Emphasis added.) He provided for the community. He took leadership of bringing the community together for long-term relations, for trading. It is really expanded…. Our Native leaders, despite setbacks, challenges, restrictions on land selections, we made it work. We formed businesses and government. We applied the same principles we use in hunting whales, [and] applied [those principles] to our businesses. And [our] faith in God. I think that is why we are, over the years, the most successful corporation.* (Utqiaġvik Whaling Captain Interview March 2016)

A successful captain derives cultural and spiritual fulfillment from being able to provide food and leadership for his community. When a captain is successful, the community sees that the whale has given itself to that captain and that the captain is skilled in leading people. Therefore, the community can place trust in that captain in positions of community leadership. Because leadership in Alaska Eskimo communities is so strongly tied to successful harvests of whales, having ample opportunity to harvest a whale is key to creating and maintaining strong leaders in a community and region.

Sharing as a central aspect of bowhead whaling, including sharing beyond the individual whaling communities, is nothing new. Communities like Anaktuvuk Pass in the Brooks Range far from the coast desired bowhead as a seasonal delicacy and as material source to make equipment components and tools (Gubser 1965:88, 255, 257). Coastal Alaskan Eskimo communities shared and traded parts of the bowhead throughout the past via established trade routes and fairs with interior communities (Gubser 1965:88, Vanstone 1962:126). Traditionally in the spring, Utqiaġvik Iñupiat would travel east along the coast to Negeliq, a trade fair site on the Colville River delta to meet with the Anaktuvuk Pass Iñupiaq who would travel north following the Colville River to Negeliq. At the Negeliq trade fair, the Anaktuvuk Pass Iñupiaq acquired baleen, *maktak*, whale bone, and other marine resources from the Utqiaġvik Iñupiaq who in turn received caribou and other inland resources (Gubser 1965:179). Some would continue farther east from the Colville River to Barter Island, which was the site of annual trade fairs which brought individuals from both the coastal and interior regions of Alaska (Bockstoce 1988; Friesen 2013). In the western arctic, a summer trade fair at Sheshalik near Kotzebue brought people from throughout the region, including the whaling villages of Point Hope and Kivalina, and even from as far as Siberia (Burch 1981).

Customary practices like *Kivgiq* (the Messenger Feast) and *Nalukataq* or *Qagruq* (the spring Whale Festival) exemplify the interconnectedness of Alaska Eskimo whaling and sharing within and beyond the community. *Kivgiq,* a drumming, song, and dance celebration that serves as source of pride and collective identity that has been held since ancestral times, was discontinued in the "early 20th century due to social, economic, and environmental pressures," and restarted in 1988 (Ikuta 2007:343). *Nalukataq* occurs in June after spring whaling to celebrate a successful bowhead hunt. Successful whaling captains and their families prepare large amounts of bowhead and other traditional foods to feed the community and visitors from other communities (Ahmaogak 2000, Bodenhorn 2000b). *Kivgiq* and *Nalukataq* are manifestations of the Iñupiaq and Siberian Yupik concept of sharing. During ancestral times, whaling captains sponsored *Kivgiq* following successful whaling seasons and invited other regional villages to trade, barter, and feast (Ikuta 2007, Riccio 1993). Traditionally and today, *Kivgiq* serves to reinforce kinship and friendship ties (Ikuta 2007, Spencer 1959:210). At *Nalukataq*, everyone celebrates the abilities of the whaling captains and their families "to feed the village until it [is] absolutely satiated" (Turner 1993:109).

In addition to oral histories and ethnographic accounts, a review of Iñupiaq and Siberian Yupik languages offers insight into the interconnectedness of bowhead (Aġvik [Iñupiaq], Aghvepik [Siberian Yupik]) and sharing from a linguistic standpoint. As part of the literature review, SRB&A searched the most recent Iñupiaq and Siberian Yupik dictionaries (Agheak-MacLean 2012, Jacobson 2008) for entries that include aspects of whaling and sharing in their definitions to get a sense of the linguistic scope of the relationship between these two terms and their variants (e.g., whale, bowhead, share) (Table 2). Some additional words were added based on interviews with whaling captains. While not exhaustive, this initial review of the dictionaries revealed terms for processing of whales into shares, who gets what shares based on their role in the whale hunt, participants in sharing, and parts of the whale being shared (Table 2). Through the breadth of words used to describe sharing particular to bowhead whale, Table 2 illustrates the complex and integrated nature of sharing and bowhead whales in Alaska Eskimo society, which affects various facets of Alaska Eskimo life, including kin relationships, community feasts and festivals, community and family roles, the enjoyment one gets from sharing with others, and the obligation to share to those in need.

Table 2: Iñupiaq and Siberian Yupik Terms Describing Aspects of Sharing, Whales, and Shares of Whales

Term	Language	Meaning
Aghllu	Siberian Yupik	Left flipper of a whale which is distributed to the captain of the crew that struck the whale a second time *or* that was first to a whale killed on the first strike.
Aghuqe	Siberian Yupik	To distribute shares of a catch; to distribute gifts
Agivike	Siberian Yupik	To take one's share of the catch to one's inlaws when one is a newlywed man
Aġviuq	Iñupiaq	To divide up, butcher a whale into shares
Aŋunġiutaq	Iñupiaq	Mid-section of bowhead whale; fresh meat and *maktak* served at the whaling captain's house several days after the whale is caught
Aqikkaq	Iñupiaq	Bowhead whale fluke; captain's share
Avarriqi	Iñupiaq	To divide up the whale flukes and distribute them as gifts in a whaling ceremony

Term	Language	Meaning
Inpisaq	Siberian Yupik	A share that is claimed by people who come down to a whale after it is harvested; generally a small "meal-sized" piece.
Itiġruġaq	Iñupiaq	Part of bowhead whale's tail between the flukes and the ventral flanks; captain's share
Kepellghek	Siberian Yupik	Captain/Clan share which is distributed throughout the clan of the successful captain.
Malghuutaq	Siberian Yupik	Each of two shares given separately (when one given for both would have sufficed); e.g., a father and son live in the same household, but they each get separate shares rather than one for the entire household.
Mikigagraq	Iñupiaq	Second share from a harvested whale's ventral flanks, "*uatit*," given to a new whaling captain
Nengigh	Siberian Yupik	To receive a share of a catch which has been distributed; i.e., share received after initial distribution to captains (to whaling crew members or other community members)
Nengiq	Siberian Yupik	Share of a catch; different way of saying *nengigh* (above).
Niaqquk	Iñupiaq	To get the head share of whale (of last boat at kill)
Niŋiq	Iñupiaq	A share (from any game animal); to get a share (of the catch in a hunt); division of a whale into shares
Piḷaaq	Iñupiaq	To cut individual shares of meat from whale bones or from the meat shares of others (usually done by old people); to dismember them
Piḷagraq	Iñupiaq	Piece of whale flipper given to umiak crew (last remaining piece after other shares are distributed)
Piḷaniaq	Iñupiaq	To wait for the butchering of the whale to be finished and the captain of the crew that killed the whale to give the go ahead to clean out the bones
Piḷḷatu	Iñupiaq	To enjoy doing something; to enjoy her/his company; to act selfishly (e.g., to strike a whale first with no regard for other crew members, take larger share than others)
Qaannak	Iñupiaq	To receive a share of the whale tongue
Qaa	Iñupiaq	Ventral surface of whale under jaw toward "chest" (this share is taken by the second boat that assists in the whale kill) or ("divided between the fourth and fifth boat to strike the whale"
Qaġlunnak	Iñupiaq	To get the lip part of the whale as a share (usually by third boat assisting in whale kill)
Qaksruġautituq	Iñupiaq	To serve food to crew and others on beach after a successful whale hunt (also a sign that whaling season is over)
Qaġlunnak	Iñupiaq	To get a share of the lower lip of bowhead whale (usually by third boat assisting in the whale kill)
Qamaggute	Siberian Yupik	To do their parts, get their shares, have their turns, everyone of them

Term	Language	Meaning
Qiŋaq	Iñupiaq	Nose; house vent; blowhole of whale; whaling captain's share, cut about two feet around the *qiŋaq*
Sakiq	Iñupiaq	Side of mouth of bowhead whale which is very oily and with thin *maktak*, one of the shares of the whale
Siḷviiññak	Iñupiaq	To receive as a share meat from the ventral surface of the whale (of the crew that reaches the struck whale)
Suqqait	Iñupiaq	Baleen; one half of the baleen is the captain's share and the other half is shared by those helping to flense and butcher the whale
Tagrua	Iñupiaq	To go out to the whaling camp and help in the cutting of the whale, thereby earning a share of the meat and *maktak* (whale skin with blubber)
Taksi	Iñupiaq	To bring home meat from the site of a catch, e.g., whale meat from edge of ice
Taliġuq	Iñupiaq	Fore flipper of seal, walrus or whale; during the Spring whale hunt, one flipper is for the harpooner and the other is shared with other whaling crews during the hunt; during the Fall hunt the harpooner receives on flipper and the other is shared by those helping to flense and butcher the whale
Tatek	Siberian Yupik	Area under the jaw of a harvested whale from which anyone can take a share.
Tavsi	Iñupiaq	Belt; strip of *maktak* and meat from the ventral waist area of whale saved for the captain to do what he wants to do with, usually served at village feast; to put one's belt on
Tavsiñaaq	Iñupiaq	One-foot-wide strip of *maktak* and meat around belly and back of whale taken by fourth boat that arrives and assists in the catch
Tunmiġaq	Iñupiaq	Share of whale meat which a new whaling captain receives from whaling boats 1 and 2 after they have taken their share from the whale's rear ventral flanks (*uatit*), which the new whaling captain distributes to the villagers
Uati	Iñupiaq	Ventral flank of bowhead whale, captain's share
Uatit	Iñupiaq	Sides of whale's ventral surface toward the tail (taken by crew when its captain gets his first whale)
Uattak	Iñupiaq	To receive the *uatit* share of whale
Urgalaq	Iñupiaq	To wait beside the whalers' homeward path in anticipation of receiving a piece of whale meat or *maktak* (of old women) (after a successful hunt, the whalers stopped at the old women waiting along the sled path and gave them whale meat and *maktak* from their shares on the sled)
Urgallit	Iñupiaq	To give a piece of whale meat or *maktak* to her = old woman as she waits by the sled path from whaling camp to village

Term	Language	Meaning
Utchik	Iñupiaq	Whale's tongue, one half of the tongue is the captain's share and the other half is shared by those helping to flense and butcher the whale
Sources: Agheak-MacLean 2012; Jacobson 2008; Workshops with Savoonga and Gambell whaling captains, March 2017.		

Distribution Methods – Bowhead Whales

Alaska Eskimo whaling communities follow prescribed rules regarding how bowhead whale is initially distributed among whaling captains, crew members, and non-whaling community members. Specific rules regarding the portioning and distribution of a harvested whale differ somewhat by whaling community and whaling captain. A whaling captain in Savoonga detailed the various methods and processes through which distribution and direct sharing occur—from the moment the whale is caught to the subsequent sharing to captains, crew members, community members, and beyond:

> *First, you distribute the whale down in the water; then, you distribute to the captains; then, each captain distributes to their crew members; then, the crew members distribute to their family; and then the family members might distribute it as well, including outside the community. We also barter for smokefish, whitefish, and other goods they have to exchange. We take some to board meetings, we share with 15 other villages at the board meetings—Kawerak Board, Norton Sound. Every community that belongs to Kawerak [receives some]. Basketball kids that come here, they get a bag of maktak to bring back with them.* (Savoonga Whaling Captains Association Meeting March 2017)

For the purposes of this report, the study team organized the discussion of distribution methods into four general categories: participatory shares, community feasts and special occasions, direct sharing (i.e., person to person), and strike transfers. Each of these are discussed below, with differences delineated by community.

Participatory Shares

Participatory shares are personal shares of a bowhead whale which are generally distributed to individuals – either captains, crew members, or other community members – who assist in some way with the harvesting, towing, or butchering of a whale. Much of the distribution of the bowhead whale, both within and outside a community, comes out of these participatory or personal shares. The formalized and ritualistic distribution of bowhead whales—and the built-in mechanisms for sharing whales beyond the community itself—illustrate that the bowhead whale harvest is not about providing for oneself but for the Alaska Native community at large.

The communities of Utqiaġvik, Wainwright, Kaktovik, and Nuiqsut generally follow similar rules for the distribution of participatory shares (Table 3 and Figure 1). Upon landing a whale, boats from other crews will meet the successful crew to assist in towing the whale to shore. Other crews and community members meet the successful crew on shore to assist with butchering the whale. Once the whale is ashore, the captain of the successful boat cuts two lines into the whale to delineate between the *Uati* (or community share), the *Tavsi* (successful crew and community feast share), and *Umiat Niŋiŋat* (boat shares). Participatory or "personal" shares generally come out of the *Umiat Niŋiŋat, Sakiq, Tavsi, Suqqaich,* and *Taliġuq* (Table 3 and Figure 1).

Each boat who participates in butchering and/or towing the whale receives a share from the *Umiat Niŋiŋat*, and this share is further distributed among crew members. One Utqiaġvik whaling captain explained that for the first successful whale harvest of the spring season, each registered whaling crew (whether or not they assisted with that particular whale) receives a share from the *Umiat Niŋiŋat;* for all subsequent whales, only crews who participated in harvesting, towing, or butchering receive a boat share. One or more boat shares are reserved for non-crew community members who come to help with the butchering of the whale. In Nuiqsut, all active crews receive a share of a landed whale, regardless of their participation in the harvest or butchering of the whale. Wainwright whaling captains indicated that an additional boat share is reserved for the community at large, with one individual stating,

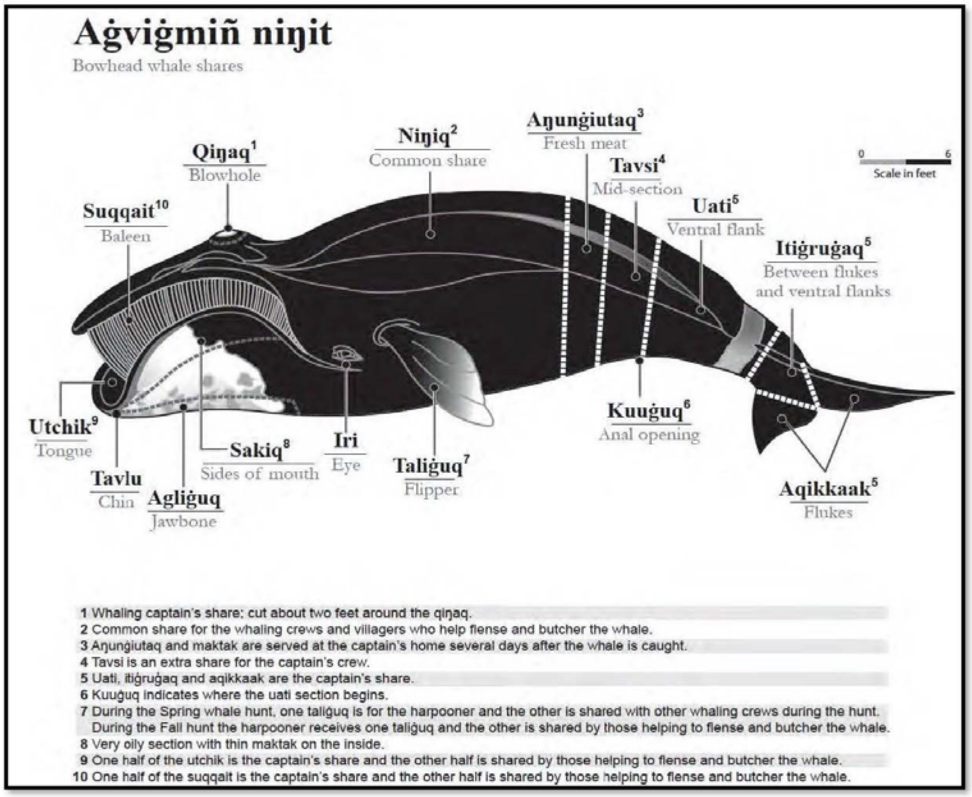
> *If there are seven boats that go out, there's an eighth share for the community and that specifically goes to the elders and others in the community that need it. The village share. Some captains will add another share for those that are helping butcher the whale. If there's seven [boats], we might divide the whale by nine.* (Wainwright Whaling Captains Association Workshop March 2017)

Table 3: Distribution of Bowhead Whales in Utqiaġvik, Wainwright, Kaktovik, and Nuiqsut

Share Type	Who Receives	Amount Received
Jaw/Baleen (*Sakiq*)	Captain	One half
	Boats who assisted with towing	One half
Flippers (*Taliguq*)	Harpooner	One
	Whoever wants the flippers ("*taquun*" to all boat crews)	One
Boat Share (*Umiat Niŋiŋat*)	Boats assisting	Boat share divided equally among all boats (community members = 1 boat) and then distributed to crew
	Community members assisting	One boat share distributed equally to community members
Captain/Community Share (*Uati*)	Nalakutaq	Determined by captain
	Christmas	
	Thanksgiving	
	Special Events	
Crew Share (*Tavsi*)	Crew members of successful boat	Approximately 14 inches of whale divided among crew members
Community/Captain Feast (*Tavsi*)	Any attending community feast on day of harvest	Approximately 14 inches of whale cooked and fed to community members
Other parts (tongue, heart, brisket, kidneys, small intestine)	Community Feast	One half
	Nalakutaq	One half

Sources: Ahgeak Maclean 2012; 2016 Key informant interviews with Utqiaġvik, Nuiqsut, and Kaktovik whaling captains.

Figure 1: Whale Distribution—Utqiaġvik, Nuiqsut, Kaktovik, and Wainwright (Agheak-MacLean 2012)



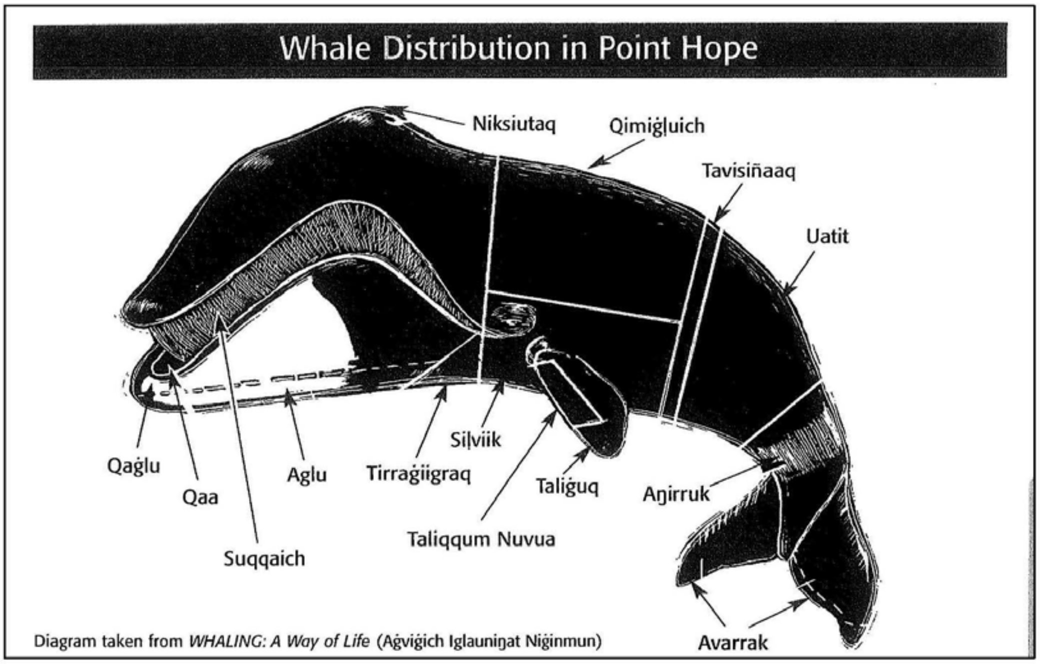
Point Hope whale distribution differs in many ways from Wainwright, Utqiaġvik, Nuiqsut, and Kaktovik (Table 4 and Figure 2). Similar to those other North Slope communities, in Point Hope a portion of the whale (*Uatit*) is reserved as the captain's share which is distributed at feasts and special occasions (see the following section). The A*varrak* and *Aŋirruk* (flukes and tail section) are also specially reserved for specific occasions. Crew shares are distributed differently from other North Slope communities, with the successful crew's share coming from a different portion of the whale (*Qimiġḷuich*) than the other crews. The other crews' shares are distributed based on the order in which they arrived at the struck whale: the second and third boats receive the S*iḷviik;* fourth, fifth, sixth, and seventh boats receive either side of the *Aglu;* eighth boat receives the *Tavisiñaaq*; and all remaining registered whaling crews receive the *Niksiutaq*. One whaling captain in Point Hope indicated that this method of distributing crew shares works to motivate crews to cooperate—the sooner a crew reaches the whale, the better share they receive. Each of the crew shares is distributed equally among crew members, including individuals who were not in the boat but provided support or assistance. Baleen is distributed between the successful captain and crew; if a second crew struck and killed the whale or secured the float, then they receive half of the captain's baleen share. Finally, the *Tirraġiigraq* is cooked up and served as meals to community members who assist with the butchering of the whales.

Table 4: Distribution of Bowhead Whales in Point Hope

Share Type	Who Receives	Amount Received
Captain's share (*Uatit*)	*Qagruk*	Determined by captain
	Slush Ice Feast	
	Spring Feast (pre-whaling)	
	Thanksgiving	
	Christmas	
Qimiġļuich	Crew members of successful crew	Split equally among successful crew members
Siļviik	Second and third boats who arrive or shoot subsequent bombs	Split equally between the two boats and subsequently distributed to crew members
Jaw area (*Aglu*) - includes tongue and *maktak*)	Fourth, fifth, sixth, and seventh boats who arrive to assist with the harvested whale	Split equally between the four boats and subsequently distributed to crew members
Tavisiñaaq	Eighth boat to arrive to harvested whale	Split equally among crew members; if no eighth crew, divided among successful captain and crew
Head area (*Niksiutaq*) - *maktak* only	All remaining registered whaling crews	Split equally among remaining crews and then distributed to crew members
Flukes (*Avarrak*)	*Qagruk* (day two)	Determined by captain
Aŋirruk	Community - Slush Ice Feast; pre-whaling spring feast; or after the 6th whale is harvested in the spring	Determined by captain
Taliqqum nuvua	Selected crew members of successful crew	Determined by captain
Tip of flippers (*Taliġuq*)	Captain	Determined by captain
Tirraġiigraq	Community members assisting with butchering	Cooked and served over two meals
Baleen (*Suqqaich*)	Successful captain and crew; crew that killed or secured whale with float if applicable	Captain 1/4-1/2 Crew 1/2 (divided equally among crew) 2nd Crew 1/2 of captain's share

Source: Worl 1980; Point Hope Whaling Captain Interviews June 2017

Figure 2: Whale Distribution in Point Hope (Jolles 2003)[1]



While the distribution of participatory shares on St. Lawrence Island (Gambell and Savoonga) shares some similarities with North Slope communities, there are also substantial differences (Table 5, Figure 3). Distribution of shares on St. Lawrence Island recognizes the strong familial clan system of the island and places emphasis on equal distribution of shares throughout each clan and whaling crew. While certain shares are reserved for those participating in the hunt, much of a whale is distributed equally to all registered whaling captains and crews regardless of whether their boats were in the water at the time of the harvest. During a key informant interview with two Savoonga elders, it was noted that the first distribution of a harvested whale occurs while the whale is still in the water. From the unsubmerged middle portion of the whale (Boat Captains' Shares), the boats who were in the water at the time of harvest cut pieces from the whale to enjoy immediately—this is referred to as the "first taste":

> *The first harvest of a whale, the distribution is out in the water, we cut off really good pieces. The young men jump on top of the whale. That's the first distribution out in the ocean.* (Savoonga Whaling Captains Association Meeting)

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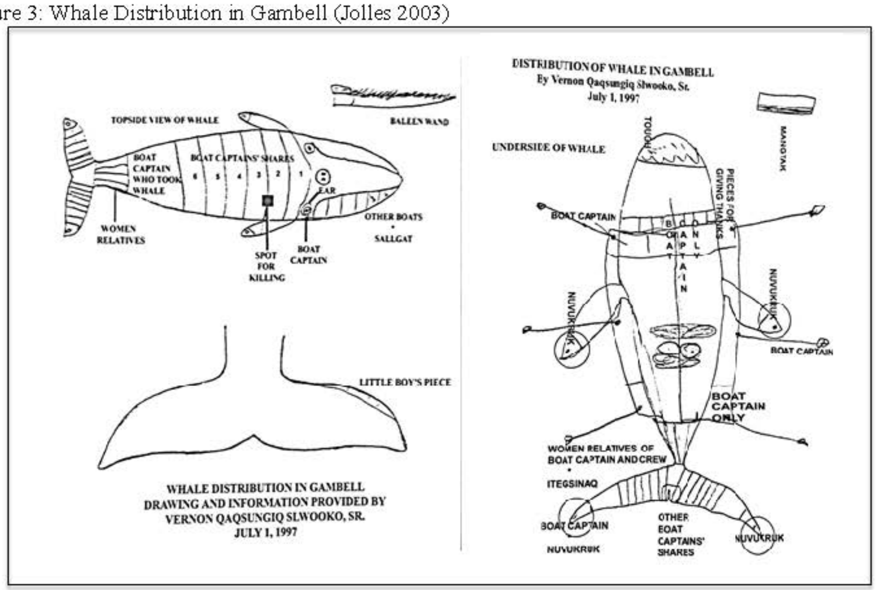
[1] One whaling captain in Point Hope noted that the depiction of the *Taliqqum Nuvua* and *Taliġuq* is incorrect. The *Taliqqum Nuvua* is usually the upper portion of the flipper (exact size determined by the captain), while the *Taliġuq* is the tip of the flipper.

Table 5: Distribution of Bowhead Whales in Gambell and Savoonga

Share Type	Who Receives	Amount Received
Head/Baleen	All registered whaling captains	Distributed 10 at a time to all registered whaling captains; extras are distributed at successful captain's discretion.
Flippers (*Aghllu*)	Captain of successful crew	One (right flipper)
	Captain of crew that struck whale second time *or* first boat to arrive at whale after it is killed on first strike	One (left flipper)
Boat Captains' Share	Boats assisting with harvest	Boat shares divided equally among all boats on the water and then distributed to crew
	Captain	Four pieces of *maktak* (two on either side of the whale) are reserved for the captain of the successful crew.
Captain/Clan Share (*Kepellghek*)	Reserved for the captain and distributed throughout the successful captain's clan	Determined by captain
Women's share (*Itegsinaq*)	Distributed specifically to the female relatives of the successful captain	Determined by captain
Area under the jaw (*Tatek*)	Anyone who wants it	Single strip below jaw; varies
Sources: Jolles 2003; Key informant interviews and workshops, Gambell and Savoonga.		

Figure 3: Whale Distribution in Gambell (Jolles 2003)



From the upper portion of the Boat Captains' Shares, the captain of the successful crew receives four slices of *maktak* cut from either side of the harvested whale. The remaining Boat Captains' Shares are distributed to all registered whaling captains. Flippers (*Aghllu*) are distributed to the successful captain (right flipper) and to the captain of the crew to strike the whale a second time (left flipper); if the whale is killed on the first strike, then the left flipper goes to the captain of the crew who first arrived to assist the successful crew. The Captain's Share, also called the Clan Share (*Kepellghek*), is distributed equally throughout the successful captain's clan; part of the successful Captain's Share is reserved for the captain's female relatives. The captain may also reserve part of this share for close friends. Finally, the flukes are split among all registered whaling captains. Community members may also come down to the whale after it is harvested and collect a small "meal-sized" share; this is referred to as *Inpisaq:*

> *When the whale is landed, they give portions to mostly ladies that come down to the beach [asking for a share]. The captain or the elder member hands out portions. It's kind of comparable to the captain's share. It's usually a smaller portion most of the time. Like a bag. To kind of make sure the ladies get a portion, too, no matter who it is. Usually everyone gets a share here. If you give a share to somebody, they will share with everyone [in their family].* (Gambell Whaling Captains Association Meeting)

Based on interviews with whaling captains, the size of an individual share can vary dramatically from whale to whale and from community to community, depending on the size of the whale, the number of crews assisting with the harvesting, towing, and butchering of the whale; and the size of the crew. For example, in Nuiqsut, there are a limited number of crews (seven registered captains in 2015) and active crew members (due to the effort and expense associated with transporting crews to Cross Island). Thus, a single crew share from a single whale is substantially larger than a single crew share in a larger community such as Utqiaġvik with 51 registered captains in 2015. However, the number of whales landed in Utqiaġvik is higher than in Nuiqsut, and therefore, whereas a crew member in Nuiqsut would generally receive a maximum of four shares (from four whales), the number of shares a Utqiaġvik crew member could receive are higher, albeit smaller in size. Of course, the exact size of a crew member's shares varies widely depending on whether he/she is a member of a successful crew; the size of the crew; how often his or her crew helps tow or butcher other crews' whales; and the size of the whales landed in a given year.

It should be noted that not all crew members are residents of their captain's community. During interviews with whaling captains for this project, several captains reported having crew members currently living in other non-whaling communities – Atqasuk, Fairbanks, Anchorage – or from other less successful whaling communities – Point Lay, Kivalina – and these crew members receive crew shares and return with these shares to their home community.

As noted earlier, much of the distribution of a bowhead whale to family and friends both within and outside whaling communities comes from the above described participatory shares. This "direct sharing" of bowhead whale products is described in subsequent sections.

Community Feasts and Special Occasions

Community feasts and special occasions are a formalized way in which bowhead whale products are distributed both within and outside whaling communities. The distribution of the whale through participatory shares (see previous section) ensures that adequate bowhead whale products are reserved for these events. In Utqiaġvik, Nuiqsut, Kaktovik, and Wainwright, the *Uati, Itiġruk, Aqikkaak, Tavsi* (one-half), and various organs (heart, intestine, kidney) are generally reserved for distribution at feasts and special occasions (Figure 1). On the day of a successful harvest (or soon thereafter), half of the *Tavsi,* in addition to portions of the tongue, heart, intestine, and kidney, are cooked and served at the captain's feast. The captain of the successful crew is responsible for deciding how the *Uati* is distributed. However, in general, the *Uati*, also referred to as the captain or community share, is placed in the ice cellar to be served at community feasts (primarily *Nalukataq*, Thanksgiving, and Christmas). Also served at the feasts are the *Itiġruk, Aqikkaak,* and parts of the organs (heart, intestines, kidney, and tongue). These community feasts often draw large numbers of individuals from other communities or regions of Alaska, most of whom receive shares of meat and/or *maktak* and bring these shares back to their home communities. During interviews, several individuals noted that "representatives" from communities in other regions will come to *Nalukataq* to obtain shares, bring them back to their home regions, and distribute these shares throughout their communities. One whaling captain described this practice as follows:

> Nalukataq *is the biggest dispersal [of whale products] because communities will charter a flight if a village has surplus money, if the Kotzebue Corporation or NANA puts in money, or if community members can afford it, they do and they come as a group. At other times [not* Nalukataq*] they have to pay for their own flight. People from Anchorage or Fairbanks have miles and will use them to fly to* Nalukataq.
> (SRB&A Whaling Captain Interview, Utqiaġvik, March 2016)

Nalukataq celebrations are coordinated by each successful captain; in some cases, multiple captains may decide to hold a *Nalukataq* together; in others, a captain will hold his *Nalukataq* independently from the other successful captains, often on a specified date that coincides with an important event in his life. The number of attendees and out-of-town guests at *Nalukataq* varies from community to community and from feast to feast, and therefore it is difficult to quantify how much meat and *maktak* is distributed at these feasts and how much leaves the community (and to where). At the Iñupiat Heritage and Language Center (IHLC) in Utqiaġvik, one photo display captures the participants at a single *Nalukataq* in Utqiaġvik in June 2004, which was held by three successful crews. The attendees at this *Nalukataq* numbered over 600 and the large serving tables included approximately 30 five-gallon buckets, another 10 to 20 large cardboard boxes, and several other totes and serving dishes. While it is unknown what is in each of the containers in the photograph, and other foods are served at *Nalukataq*, the majority of food served at this festival is whale meat and *maktak*.

Another forum for distributing bowhead whale products from the *Uati* is at special occasions such as the AEWC mini-conventions usually held in Utqiaġvik. Representatives from all 11 AEWC whaling communities generally attend these meetings. At these meetings, captains bring meat and *maktak* to be distributed to out-of-town guests, particularly those from communities who have not been successful in recent years, such as Kivalina, Little Diomede, and Wales. One whaling captain recalled a recent mini-convention where multiple captains had brought bowhead whale for a community feast; he sent the leftover *maktak* and meat from that feast to Savoonga, Gambell, Little Diomede, and Kivalina and paid the freight; in a sense, this was more an act of direct sharing, which is described in more detail below.

Similar to other North Slope whaling communities, in Point Hope, the *Uatit* in addition to other select portions (*avarrak, aŋirruk)* is reserved for feasts and special occasions. Point Hope festivals include *Qagruk*—the three-day whaling festival which takes place after a whaling season; the pre-whaling spring feast; the Slush Ice Feast in the fall; Thanksgiving, and Christmas. A whaling captain in Point Hope noted that he generally reserves approximately one-third of his *Uatit* for each of the three main community feasts: *Qagruk*, Thanksgiving, and Christmas. The tail section of the bowhead is generally reserved for the pre-whaling spring feast and for the Slush Ice Feast in the fall. It is at these various feasts and special occasions that much of the whale is distributed throughout the community and beyond. The 2017 *Qagruk* in Point Hope was an especially celebratory affair, because the community had successfully struck 10 whales (their quota) without losing a single whale. The study team traveled to Point Hope a couple of days after the 2017 *Qagruk*. Point Hope whaling captains estimated that approximately 300 individuals from other communities—including communities from the North Slope, NANA region, and other areas—had come for the festival and that all of these individuals brought whale—in many cases, multiple totes—home with them. This was witnessed by the study team whose flight back to Kotzebue contained multiple large totes of meat and *maktak*. One individual, who is originally from Point Hope and attended the 2017 *Qagruk,* estimated that she and her family would be returning with multiple totes of approximately 50-pounds of whale products to distribute to her family. She also noted that residents from Kivalina had traveled to Point Hope by boat for the whaling festival and returned with a boatload of whale. Thus, the *Qagruk* whaling festival in Point Hope is a major mechanism for the distribution of bowhead whale throughout the community and beyond.

St. Lawrence Island whaling culture is less focused on formal feasts or festivals. When asked about special occasions for distribution of bowhead whale on St. Lawrence, whaling captains indicated that while community-wide feasts do occur, they are not formal celebrations, like *Nalukataq* on the North Slope. This may be due, in part, to a clan system that emphasizes equal distribution of shares throughout each clan and a more built-in mechanism of distributing a harvested whale equally to all registered whaling crews (who, in turn, distribute the whale throughout the community through direct sharing). Respondents identified several non-formal celebrations which facilitate sharing and distribution of bowhead whale, including funerals, birthday celebrations, Thanksgiving, and Christmas. In addition, a number of whaling captains and crew members noted that basketball tournaments in their communities provide an opportunity for trade and sharing. As illustrated in the following Savoonga discussion, high school and middle school basketball players from other communities often come with subsistence foods from their regions to trade for *maktak,* and *maktak* is also served as part of the tournaments themselves:

> *Respondent 1: Basketball kids that come here, they get a bag of maktak to bring back with them.*
> *Respondent 2: We call it Maktak Eater's Basketball.*
> *Respondent 3: They'll bring whitefish to barter for maktak.*
> *Respondent 1: Highschool, middle school ballers will come to town and their families will send them with a care package and ask, "Can you send some maktak?" In the summer, relatives from Chukotka come to the island, and they have festivals, and they get maktak that way. When we host a basketball tournament, people cut up maktak and bring it up to the guestrooms up there, so that the students can eat up there.*
> (Savoonga Whaling Captains Association Meeting March 2017)

The sharing of bowhead at basketball tournaments is not limited to St. Lawrence Island. Whaling captains in Wainwright also described "boxes and boxes of *maktak*" leaving on airplanes after tournaments and when Wainwright school children travel to other communities. In addition, a basketball tournament was held in Point Hope just days after the conclusion of their *Qagruk* festival, and whaling captains noted that even more whale would be leaving the community with the tournament participants.

Direct Sharing

Direct sharing (i.e., being shared directly from an individual in a whaling community to other individual[s] in that community or another community) most frequently comes out of the personal or participatory shares discussed earlier, and can also be referred to as "secondary" sharing after initial distribution of the whale. Residents of a whaling community often send portions of their personal shares to family, friends, and trading partners in other whaling and non-whaling communities. Aside from community feasts and special occasions, direct sharing is the most common way for residents of non-whaling communities to receive bowhead whale.

Direct sharing of participatory or personal shares may occur in several forms. First, a resident of a whaling community may ship bowhead to family and friends in other communities. If the family and/or friends live in a nearby community, the individual may transport meat or *maktak* to the community personally, such as by snowmachine. In some cases, individuals in non-whaling communities may travel to a whaling community, receive bowhead whale from family or friends, and then return to their home communities with their *maktak* or meat as baggage. Finally, residents of whaling communities will sometimes transport bowhead whale to larger urban or regional centers, either by plane or truck (in the case of Nuiqsut residents who can access the Dalton highway via ice roads in the winter), and distribute bowhead products to family, friends, churches, and Native people through other organizations in these communities.

In many cases, direct sharing occurs with no expectation of receiving anything in return; in other cases, residents have bartering relationships with family or friends and will receive other subsistence foods such as berries, moose, fish, or even hunting supplies in return for sending bowhead. These trading relationships allow for a greater diversity of subsistence foods beyond what is available in one's region:

> *There's also trading with other people. With Kotzebue—we don't have sheefish and they do, and they don't have maktak over there…. Just for myself, I travel to Anchorage quite often, so I carry a cooler of maktak, walrus, and caribou, and when I'm ready to come back home, they fill up my cooler with fresh fruit. You'll even see people trading maktak to Barrow people for fresh fruit. Because their shares are tinier in Barrow…. But we share with Barrow for fish, Atqasuk for fish, Nuiqsut for fish, Anaktuvuk for caribou, Kotzebue for fish and wood, Anchorage for more food—like fresh fruit. Some people will even buy you a tent, if you need a tent when you share with them. From Alaska Tent and Tarp. Some [people] will buy [whaling equipment], some will buy gas so that we can go hunt.* (Wainwright Whaling Captains Association Meeting March 2017)

Once an individual has sent bowhead whale to an individual in another community, there is often a tertiary level of sharing that occurs within that community or region. Several whaling captains explained that they send bowhead whale to a single family member with the knowledge that it will be further distributed among family throughout that community and/or region. The following whaling captains in Nuiqsut and Savoonga described this method of distribution as follows:

> *Here is how we do it – our family, anyway. If I'm sending a whole bunch of whale to Barrow, we send it to one person, and that person distributes it to families we want to give shares to. We know who we want it to go to, but when we give it to them [we distribute it through a single person].* (SRB&A Whaling Captain Interview, Nuiqsut, May 2016) (Savoonga Whaling Captains Association Meeting March 2017)

Another Utqiaġvik whaling captain described how family in Anchorage further distribute to relatives "spread far and wide" in communities such as Fairbanks, Palmer, Wasilla, Tok, Glennallen, Bethel, and Seward.

Direct sharing does not only come out of participatory or personal shares; whaling captains in Utqiaġvik, Kaktovik, Nuiqsut, and Wainwright often send *maktak* and meat from their *Uati* directly to other communities. For example, a whaling captain may send a portion of his or her *Uati* to another community at their request or if they are in need of meat. During interviews in Utqiaġvik and Nuiqsut, a number of whaling captains reported sending portions of their *Uati* to Anaktuvuk Pass and Atqasuk, both North Slope communities that do not have whaling crews, but have kinsmen and a long history of social relationships and sharing. In other cases, a community will make a specific request to the AEWC or another entity such as the NSB for whale meat and/or *maktak*, these organizations will forward the request on to whaling captains, and the captains will put together a shipment out of their *Uati* or, if they choose, personal shares. The NSB, AEWC, or a community-based organization (e.g., village corporation) will sometimes fund a charter plane to ship bowhead to communities in need. In other cases, a captain or his crew may transport the bowhead directly to the community. A whaling captain in Nuiqsut, for example, described transporting two sled loads of *maktak* and meat, weighing up to 1,000 pounds each, to Anaktuvuk Pass by snowmachine one year. Similarly, whaling captains on St. Lawrence Island indicated that successful captains often send a share of bowhead to the mainland for regional or elders' conferences, or to donate to elders' lunch programs. As one Savoonga whaling captain described, "If we have plenty to share, then we send out to elders' nutritional programs that ask for it; and they try to send the most choice parts to the elder's programs" (Savoonga Whaling Captains Workshop March 2017).

Churches and other charity organizations, both in whaling and non-whaling communities, are other entities that receive shares of bowhead. Captains described providing bowhead to churches with primarily Alaska Native congregations in Fairbanks, Anchorage, and the NANA region, and these churches subsequently distribute the meat and *maktak* to their congregations.

During interviews and workshops, whaling captains and crew members frequently stressed that sharing is not a choice but rather a duty, and something that comes naturally. They noted that if they receive a request for bowhead they are personally bound to fulfill that request – whether they know the requestor or not. Residents noted that these requests often come directly through phone calls, in person, or even through social media:

> *Everybody that moves out of town to the mainland, they want a taste of it, that's why we will send shares to family members—for a taste, if they want it. Friends will call you up and see if they can get a share of it.* (Savoonga Whaling Captains Association Meeting March 2017)

> *There's even[Native] people that we've met on Facebook that we've never met in person, and we share with them. [Because] they ask!* (Wainwright Whaling Captains Association Meeting March 2017)

> *I sent a bunch of maktak to Selawik, when those kids came [to Wainwright]. We share with[Native] people we do not know. They ask, and we give it!* (Wainwright Whaling Captains Association Meeting March 2017)

As noted earlier, direct sharing is one of the primary ways in which individuals in non-whaling communities receive bowhead whale, aside from the distribution of bowhead at community feasts. Interviews and workshops with whaling captains and crew members elicited additional information about the recipients of direct sharing. This information is described in further detail under "Field Data on Sharing Outside Alaska Eskimo Whaling Communities."

Strike Transfers

While the IWC sets the overall quota of landed whales for Alaska Eskimo whaling communities, the AEWC internally decides how that quota is allocated among individual whaling communities. Once a community has reached its allocation for struck whales, they either must cease whaling, or they may request an extra strike (a "strike transfer") through the AEWC. Generally, unused strikes may be transferred by communities who still have unused strikes but are unable to whale (or continue whaling) that season due to poor or unsafe whaling or boating conditions. Strikes may be transferred through the

AEWC or directly from one community to another, at the recipient community's request and with the oversight of the AEWC.

Several captains noted that when a community transfers a strike to another community, they often (but not always) receive a share of the *Uati* in return. Alternatively, they may send crew from their community to the community that received the transfer, thus receiving a share through those crew members. Alternately, there may be an understanding that a community who receives the strike transfer will return the favor (i.e., transfer a strike) in the future if needed.

Transferring strikes was described as a form of sharing by a number of whaling captains. Being the southernmost Alaska Eskimo whaling communities, Gambell and Savoonga are the first to hunt the bowhead whale in the spring as they migrate north. If any strikes remain after that spring hunt, the likelihood of their transferring those strikes to other whaling communities may be higher. As one individual in Savoonga observed,

> *If we had the opportunity we would exhaust our quota, but we gave our quota away to the other communities because they were closer to shore in those communities. We know it's important for them, so we transfer quotas.* (Savoonga Whaling Captains Association Meeting March 2017)

Point Hope whaling captains noted that they generally receive their strike transfers from communities farther south (e.g., Kivalina, Savoonga, Gambell), and transfer their own strikes farther north to communities such as Wainwright and Utqiaġvik. However, they also noted some reciprocity in these actions; for example, if a strike is transferred and then unused, it is often transferred back to the original community. As one captain described,

> *It works like – our transfers usually come from that side [farther south]. Sometimes we'll transfer a strike down there, and if they don't use them, they'll send it right back to us. Like, last year we asked for transfers from Barrow, but then the ice got bad so we sent them back to Barrow!* (Point Hope Whaling Captains Association Meeting June 2017)

It is important to note that as bowhead whale distribution in the Bering Sea has changed, the whaling season for Gambell and Savoonga has also evolved and expanded to include fall and winter whaling. This may affect the ability—or willingness—of those communities to transfer strikes as readily in the future. One whaling captain in Gambell summarized this phenomenon as follows:

> *That's what I commented earlier, the two seasons—whale and walrus—they are starting to combine. With the ice conditions, weather conditions, the spring hunting is starting to overlap with Barrow hunting. They'll ask us for a strike and we'll still be out hunting. We never get a whale yet, and, 'What, Barrow got a whale??' or Wainwright – one of those villages.*

Other communities who have had limited success harvesting whales in recent years—such as Kivalina, Wales, and Little Diomede—are also more likely to transfer unused strikes and thus contribute to the annual AEWC harvest through the sharing of those strikes. However, it is important to note that these communities' whaling success may change in the future due to changes in bowhead whale distribution; this may result in fewer opportunities for strike transfers in the future.

During a meeting of the AEWC commissioners in December 2015, the commissioners discussed strike transfers as a form of sharing between communities, with one describing it as "automatic sharing." When a community transfers a strike to another community, they are essentially *giving* that whale away. Thus, Alaska Eskimo whaling communities who have had lower success rates harvesting whales in recent years are still an important part of the bowhead whale sharing complex and, as one commissioner put it, transferred strikes should not be considered "unharvested whales" for those communities.

Alaska Eskimo Population and Distribution Trends

This section focuses on the demographic changes that have occurred among Alaska Natives over time, with a particular emphasis on the nearly five decades that have passed since the end of the base period used to calculate need (1969). These data provide context necessary for understanding how Alaska Native populations have grown and shifted over time, and how traditional sharing networks have evolved and expanded to accommodate these changes.

Historic population data specific to Alaska Eskimos, rather than for Alaska Natives as a whole, are limited and inconsistent. Where possible, this discussion incorporates data specific to Alaska Eskimos; however, in other cases data are provided for Alaska Native populations as a whole, with the assumption that demographic trends are similar across major Alaska Native groups.

After a significant decline in the Alaska Native population after European contact and relatively stagnant growth from the 1800s through the mid-1950s, the population of Alaska Natives began to increase starting in the 1960s and continued through the 1990s and 2000s (Figure 4); this trend was also evident for Alaska Natives of the 11 Alaska Eskimo whaling communities with the exception of a minor decline in the Alaska Native population between 2000 and 2010 (Figure 5 and Table 6).

According to the most recent U.S. Census survey, there were 138,312 Alaska Natives living in Alaska in 2010 (U.S. Census Bureau 2016). Between 1950 and 2010, the percentage of Alaska Natives living in urban areas[2] of Alaska increased from six percent to 49 percent of Alaska Natives (Table 7). According to the 2010 census, which collected detailed data on American Indians and Alaska Natives by tribe and language, approximately one-half (48 percent) of Alaska Natives are Eskimo (either Iñupiaq or Yup'ik) (Table 8). Approximately 50 percent of Iñupiaq individuals live in rural Alaska, while the other 50 percent live in urban areas of Alaska or outside Alaska. Yup'ik Eskimos are more likely to live in rural Alaska than other Alaska Native groups, with 71 percent living in rural Alaska in 2010; 20 percent in urban areas of Alaska; and nine percent outside Alaska. Overall, approximately 40 percent of Alaska Eskimos live in urban areas of Alaska or outside Alaska in other states. In Anchorage alone, the U.S. Census documented an estimated 6,103 Iñupiat and 4,835 Yup'ik residents (U.S. Census Bureau 2016). Anchorage has long been known as Alaska's "biggest Native Village" and is home to the largest Yup'ik and Iñupiaq communities in the state (Dunham 2011). While the percentage of Alaska Natives living outside rural areas has increased, the Alaska Eskimo population in, for example, the 11 Alaska Eskimo whaling communities has also grown, with only a slight decline during the latest 2010 census (Table 6). Thus, there are more Eskimos living in both the rural communities and in urban areas.

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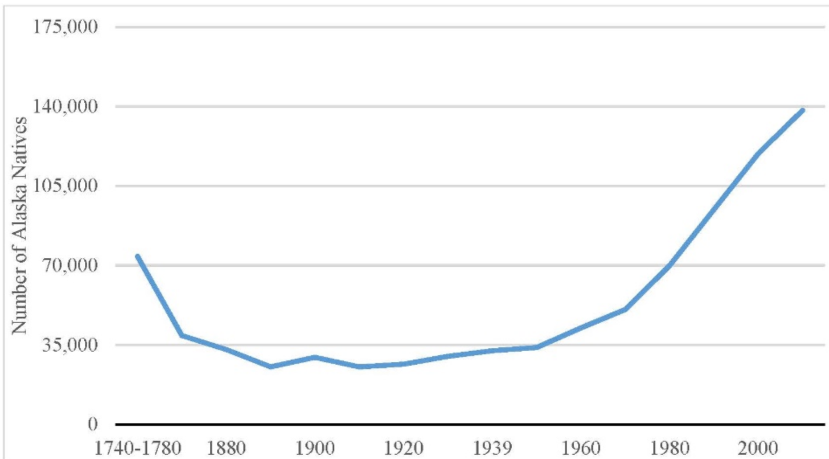
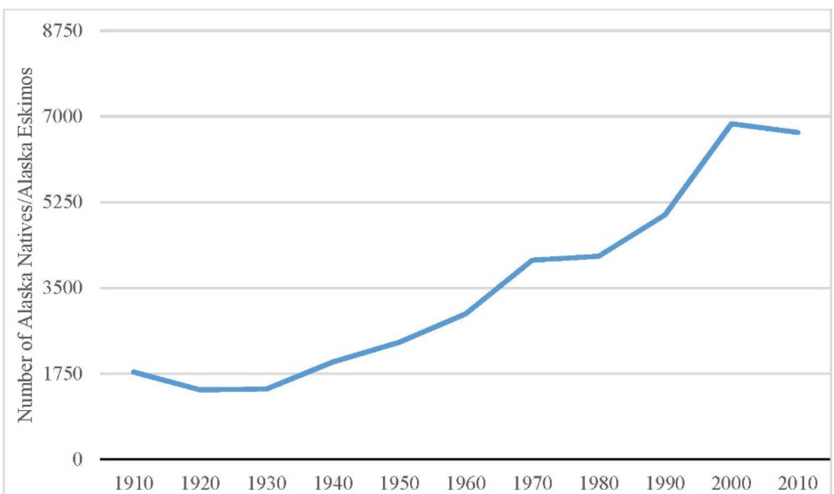
[2] Data from 1950 and 1960 are based on U.S. Census data on American Indians, Aleuts, and Eskimos living in "Urbanized" areas. Data from 1970-2000 are based on the Institute of Social and Economic Research (ISER) Status of Alaska Natives Report, which defines "urban" as the Anchorage Municipality, Fairbanks North Star Borough, Matanuska-Susitna Borough, Kenai Peninsula Borough, and Juneau City and Borough. The 2010 data follows the ISER definition of "urban."

Figure 4: Alaska Native Populations in Alaska, 1700s-Present



Sources: Rogers 1971 (1740-1950); Goldsmith et al. 2004 (1960-2000); U.S. Census Bureau 2016 (2010)

Figure 5: Number of Alaska Natives/Alaska Eskimos Living in 11 Alaska Eskimo Whaling Villages



Notes: For sources, see Table 1. Alaska Native population data are not available for 1970 so total population is used and Alaska Native/Alaska Eskimo population is likely overestimated.

Table 6: Alaska Native/Alaska Eskimo Population in Alaska Eskimo Whaling Communities, 1910-2010[3]

Community	1910	1920	1930	1940	1950	1960	1970[3]	1980	1990	2000	2010
Gambell	218	303	246	293	310	352	372	425	504	622	654
Savoonga	134	132	130	207	243	294	364	463	493	614	637
Wales	336	132	168	189	133	124	131	122	143	137	136
Diomede	90	101	140	120	103	88	84	No Data	167	137	110
Kivalina	84	92	91	86	111	138	188	237	309	364	366
Point Hope	252	145	130	258	266	320	386	434	585	686	629
Point Lay	13	No Data	No Data	145	75	No Data	No Data	63	111	218	168
Wainwright	84	106	194	327	221	248	315	372	462	508	510
Utqiaġvik	571	409	337	362	929	1,295	2,104	1,700	1,705	2,933	2,889
Nuiqsut[1]								181	327	386	360
Kaktovik[2]						112	123	148	186	246	215
Totals	1,782	1,420	1,436	1,987	2,391	2,971	4,067	4,145	4,992	6,851	6,674

[1] Nuiqsut was not permanently settled until 1973

[2] Kaktovik was not permanently settled until 1953

[3] Reports total populations for 1970 because U.S. Census data on Alaska Native or Alaska Eskimo Populations are not available; therefore the Alaska Native/Alaska Eskimo population is likely overestimated.

Sources: 1910-1960 from Braund et al. (1988) for nine original whaling communities; from SRB&A (1991) for Little Diomede; and from SRB&A (2008) for Point Lay. 1980-2010 from U. S. Census Bureau (2016).

[3] Table represents Alaska Eskimo populations for 1910-1960 and for 1980-1990. Data specific to Alaska Eskimos or Alaska Native populations are not available for 1970 and therefore total populations are provided. For 2000 and 2010, the table reports Alaska Native/American Indian populations. Data specific to Alaska Eskimos are not available for the 2000 and 2010 census years.

Table 7: Percentage of Alaska Natives Living in Urban and Rural Areas, 1950-2010

Year	Urban[1] Share	Rural Share
1950	6%	94%
1960	13%	87%
1970	19%	81%
1980	30%	70%
1990	37%	63%
2000	42%	58%
2010	49%	51%
[1]"Urban" for 1950 and 1960 is based on the U.S. Census Bureau definition. For 1970-2010, "Urban" includes the Anchorage Municipality, Fairbanks North Star Borough, Matanuska-Susitna Borough, Kenai Peninsula Borough, and Juneau City and Borough.		
Sources: U.S. Census Bureau 2016 (1950-1960); Goldsmith et al. 2004 (1970-2000); ADOLWD 2016 (2010)		

Table 8: Residence by Tribal Group, 2010

Tribal Group	Rural Alaska	Urban Alaska	Outside Alaska	Total Number	Percent of Alaska Natives
Alaskan Athabascan	35%	39%	26%	22,484	16%
Aleut	26%	32%	42%	19,282	14%
Tlingit-Haida	24%	26%	49%	26,080	19%
Tsimshian	41%	10%	48%	3,755	3%
Eskimo (Iñupiat or Yup'ik)	61%	23%	16%	67,249	48%
Iñupiat	50%	27%	23%	33,360	24%
Yup'ik	71%	20%	9%	33,889	24%
Total	45%	27%	28%	100%	100%
Total Number Reporting	61,804	37,757	39,289	138,850	138,850
Source: U.S. Census Bureau (2016) Race Reporting for the American Indian and Alaska Native Population by Selected Tribes: 2010					

In summary, in 1969 (the end of the base period on which the per capita need is based), approximately 19 percent of Alaska Natives lived in urban areas; in 1990, two years after the IWC accepted the quantification of need for Alaska Eskimo whaling communities, 37 percent lived in urban areas; and in 2010 nearly one-half (49 percent) of Alaska Natives lived in urban areas. More specifically, 50 percent of Iñupiat either lived in urban Alaska or outside Alaska, and 29 percent of Yup'ik Eskimos lived in urban Alaska or outside Alaska (Table 8).

It is important to note that despite the increase in the number of Alaska Natives living in urban areas, rural Alaska Native population rates continue to rise. In 2010, there were an estimated 6,674 Alaska Natives living in the 11 Alaska Eskimo whaling communities (Table 6). When compared to populations as a whole, 5,383 Alaska Natives lived in the nine Iñupiaq whaling communities compared to a total of 33,360 Iñupiat living in the United States as a whole (16 percent of the total Iñupiaq population) (Table 8). Furthermore, 1,291 Alaska Natives lived in the Siberian Yupik whaling communities of Gambell and Savoonga compared to 33,889 Yup'ik Eskimos living in the United States as a whole (four percent of the Yup'ik population). Thus, 16 percent of Iñupiat and four percent of Yup'ik Eskimos provide 100 percent of bowhead *maktak* and meat.

Reasons for moving out of one's rural community to other areas of Alaska include job opportunities, medical reasons, financial reasons, and educational pursuits. Alaska Natives often alter their living situation on a temporary basis for the above reasons, with the intention of returning to their home communities in the future. A recent social indicators survey in six coastal North Slope communities found that approximately half of male (44 percent) and female (50 percent) Iñupiat household heads had considered moving away from their community during the previous five years (SRB&A Unpublished). In a majority of cases, respondents cited reasons such as education, employment, financial reasons (e.g., high cost of living), and family/medical reasons for why they had considered moving away. The lack of jobs in rural Alaska is a major reason for the increase in urban Alaska Native populations. As of the 2000 U.S. Census, 46 percent of Alaska Native jobs were located in urban areas; 36 percent were in remote rural areas and nearly a third of those were concentrated in regional centers (Goldsmith et al. 2004). Native women of working age are particularly likely to live in urban areas. Increased interest in obtaining a university education is another reason for the higher urban Alaska Native populations. Enrollment of American Indian and Alaska Native students in colleges and university more than doubled between 1976 and 2006 (NCES 2008).

Despite the demographic changes in the Alaska Native population and the increasing proportion of Alaska Natives living in urban areas, ties to traditional lands, activities, and food remain strong. For Alaska Natives living outside their home communities, the consumption of traditional subsistence foods helps maintain cultural identity and social ties by facilitating participation in traditional sharing networks. In fact, residents living outside their home communities continue to participate in rural subsistence economies either by returning home and participating in subsistence activities seasonally; or by providing equipment, supplies, and money to support subsistence activities in their home communities, in exchange for subsistence foods (Kofinas et al. 2016). The sharing of bowhead whale to these individuals is discussed in further detail under "Existing Data on Sharing Outside Alaska Eskimo Whaling Communities."

While Alaska Natives living in more populated areas may have easier access to store-bought foods, it is important to emphasize that store-bought foods are not an adequate replacement for subsistence foods. As stated in ResourceEcon et al. (2011):

"...the replacement of subsistence foods by store bought foods has been demonstrated to be associated with deficiencies in A, C, D, and folic acid, imbalances of calcium metabolism, and increases in obesity (associated with carbohydrate consumption increase and diabetes), dental caries, acne, and iron deficiency anemia.

In addition, store-bought foods do not meet the social, cultural, or economic needs of Alaska Native people (see "Definition of Subsistence," above). Previous efforts to quantify the replacement or economic value of subsistence foods have generally concluded that while certain aspects of subsistence can be quantified, it is impossible to fully account for the social, cultural, and nutritional value of subsistence (ResourceEcon et al. 2011).

Existing Data on Sharing Outside Alaska Eskimo Whaling Communities

SRB&A conducted a review of existing quantitative data on the sharing outside Alaska Eskimo whaling communities, with an emphasis on bowhead whale. There are several sources which characterize the geographic extent of sharing by whaling communities. An early source of these data is the *Subsistence Study of Alaska Eskimo Whaling Villages* (Alaska Consultants, Inc. and SRB&A 1984). The study included 370 household surveys in nine communities with whaling captains, whaling crew members, and other community residents. The interviews were conducted in 1982 and included questions about the sharing and distribution of bowhead whale to other whaling and non-whaling communities. According to the survey results, 97 percent of respondents reported sharing bowhead whale (Table 9) and between 73 percent and 100 percent of respondents in each village reported sharing both within their own village in addition to other villages (Table 10). Table 11 shows the extent of inter-village sharing.

Table 9: Sharing of Bowhead Whale Meat – Alaska Bowhead Whaling Village Respondents, 1982

Sharing	Percent of Respondents
Share bowhead whale meat (including *maktak*)	97.0%
Do not share bowhead whale meat (including *maktak*)	1.6%
Don't Know	1.4%
Total	100%
Source: Alaska Consultants, Inc. and SRB&A 1984	

Table 10: Extent of Inter-Village Bowhead Whale Meat Sharing by Village – Alaska Bowhead Whaling Village Respondents, 1982

Recipient Community	Percent of Respondents Sharing									
	Gambell	Savoonga	Wales	Kivalina	Point Hope	Wainwright	Utqiaġvik	Nuiqsut	Kaktovik	All Respondents
This village only	0%	0%	11%	4%	3%	3%	13%	27%	0%	7%
Other villages only	6%	2%	0%	0%	5%	9%	4%	0%	0%	3%
This village and others	94%	98%	89%	96%	92%	89%	83%	73%	100%	90%
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Number of Respondents	51	52	28	25	37	35	70	30	26	354
Source: Alaska Consultants, Inc. and SRB&A 1984										

Table 11: Extent of Inter-Village Bowhead Whale Meat Sharing by Village and Recipient Community - Alaska Bowhead Whaling Village Respondents[1], 1982

Recipient Community	Percent of Respondents Sharing								
	Gambell	Savoonga	Wales	Kivalina	Point Hope	Wainwright	Utqiaġvik	Nuiqsut	Kaktovik
Gambell	-	96%	0%	0%	0%	6%	3%	0%	0%
Savoonga	96%	-	0%	0%	0%	0%	0%	0%	0%
Nome	98%	78%	100%	0%	18%	0%	2%	0%	0%
Unalakleet	4%	8%	0%	0%	0%	0%	0%	0%	0%
Elim	3%	14%	8%	0%	3%	0%	0%	5%	0%
White Mountain	3%	6%	0%	0%	0%	0%	0%	0%	0%
Teller	0%	2%	68%	0%	0%	0%	0%	0%	0%

Recipient Community	Percent of Respondents Sharing								
	Gambell	Savoonga	Wales	Kivalina	Point Hope	Wainwright	Utqiaġvik	Nuiqsut	Kaktovik
Brevig Mission	0%	0%	76%	0%	0%	0%	0%	0%	0%
Wales	0%	0%	-	0%	0%	3%	0%	0%	0%
Diomede	0%	4%	24%	0%	0%	0%	0%	0%	0%
Kotzebue	0%	2%	0%	96%	85%	19%	9%	5%	0%
Selawik	0%	0%	0%	17%	0%	0%	0%	0%	0%
Ambler	0%	0%	0%	13%	9%	0%	0%	0%	0%
Kiana	0%	0%	0%	29%	0%	0%	0%	0%	0%
Shungnak	0%	0%	0%	13%	3%	0%	0%	0%	0%
Kobuk	0%	0%	0%	8%	6%	0%	0%	0%	0%
Noorvik	0%	0%	0%	25%	12%	0%	0%	0%	0%
Noatak	0%	0%	0%	96%	71%	10%	2%	5%	0%
Kivalina	0%	0%	0%	0%	88%	0%	0%	0%	0%
Point Hope	0%	0%	0%	46%	-	52%	19%	0%	15%
Point Lay	0%	0%	0%	4%	24%	52%	26%	5%	4%
Wainwright	0%	2%	0%	4%	18%	-	64%	14%	27%
Atqasuk	0%	0%	4%	4%	0%	55%	47%	5%	12%
Utqiaġvik	8%	4%	0%	4%	62%	100%	-	91%	100%
Nuiqsut	0%	0%	0%	4%	3%	42%	45%	-	85%

Recipient Community	Percent of Respondents Sharing								
	Gambell	**Savoonga**	**Wales**	**Kivalina**	**Point Hope**	**Wainwright**	**Utqiaġvik**	**Nuiqsut**	**Kaktovik**
Kaktovik	0%	0%	0%	4%	0%	39%	55%	95%	0%
Anaktuvuk Pass	3%	0%	0%	0%	3%	39%	43%	32%	58%
Other Alaska Villages[2]	29%	33%	28%	25%	38%	3%	5%	3%	0%
Anchorage/Fairbanks/Juneau	42%	53%	4%	0%	38%	45%	43%	9%	85%
Other	6%	2%	0%	8%	18%	4%	0%	5%	19%
Number of Responses	140	155	84	96	169	148	212	67	105
Number of Respondents	48	51	25	24	34	31	58	22	26

[1] Sharing during the last year the respondent's village got a whale. Respondents were asked to name each village that his or her household shared bowhead whale meat with that year.

[2] In the case of Gambell, Savoonga, and Wales, "Other Alaska Villages" includes other Bering Strait Native Corporation Villages. In the case of Kivalina and Point Hope, "Other Alaska Villages" includes other NANA Regional Corporation villages.

Source: Alaska Consultants, Inc. and SRB&A 1984

Table 11 shows that as early as 1982, the inter-village distribution of bowhead whales was widespread, with each region showing slightly different sharing patterns. In general, respondents were most likely to have shared bowhead whale to communities within their own regions (e.g., Wales, Gambell, and Savoonga sharing to other Bering Straits communities such as Nome, Brevig Mission, and Teller). However, sharing outside their regions, particularly to Anchorage, Fairbanks, and Juneau, was also not uncommon.

A second more recent source of data on sharing, although not specific to bowhead whales and not available for all Alaska Eskimo whaling communities, is the NSB Census. The NSB conducted these censuses in North Slope communities in 1993/94, 1998, 2003, 2010, and 2015. The 1998, 2003, 2010, and 2015 census included questions about sharing of subsistence foods both within and outside North Slope communities. As shown in Table 12, the percentage of households sharing subsistence foods increased between 1998 and 2010 for all sharing categories, and in 2015 these percentages stayed similar to 2010, with a few exceptions. Specifically, the percentage of households sharing outside of their own community and outside the North Slope showed an increase. For some North Slope communities, sharing with the NANA Region showed an even more dramatic change.

Table 12: Percentage of Households Sharing Subsistence Foods, by Recipient Community

		Percent of HH Sharing			
Community	**Sharing to…**	**1998**	**2003**	**2010**	**2015**
Utqiaġvik	Own Community	34%	88%	94%	94%
	Other NSB Community	22%	30%	56%	55%
	NANA Community	9%	10%	24%	28%
	Anchorage	17%	24%	46%	48%
	Fairbanks	12%	16%	28%	31%
	Other Community	6%	13%	22%	21%
Kaktovik	Own Community	33%	82%	90%	98%
	Other NSB Community	34%	21%	53%	50%
	NANA Community	1%	2%	20%	10%
	Anchorage	8%	4%	12%	42%
	Fairbanks	20%	14%	43%	35%
	Other Community	4%	7%	22%	15%
Nuiqsut	Own Community	20%	70%	93%	98%
	Other NSB Community	45%	39%	74%	63%
	NANA Community	3%	4%	25%	21%
	Anchorage	16%	4%	62%	48%
	Fairbanks	14%	9%	53%	36%
	Other Alaskan Community	3%	0%	23%	10%

Community	Sharing to…	Percent of HH Sharing 1998	2003	2010	2015
	Outside Alaska			6%	
Point Hope	Own Community	26%	76%	95%	95%
	Other NSB Community	22%	27%	56%	66%
	NANA Community	29%	35%	67%	84%
	Anchorage	14%	25%	66%	80%
	Fairbanks	5%	11%	27%	39%
	Other Alaskan Community	4%	6%	26%	24%
	Outside Alaska			11%	
Point Lay	Own Community	22%	65%	85%	100%
	Other NSB Community	28%	38%	70%	68%
	NANA Community	16%	27%	62%	35%
	Anchorage	25%	22%	53%	36%
	Fairbanks	6%	3%	12%	13%
	Other Community	3%	8%	15%	13%
Wainwright	Own Community	27%	57%	93%	97%
	Other NSB Community	48%	35%	65%	51%
	NANA Community	8%	9%	18%	19%
	Anchorage	18%	17%	47%	37%
	Fairbanks	7%	5%	9%	12%
	Other Alaskan Community	5%	1%	9%	12%
	Outside Alaska			9%	
Average Across All North Slope Communities [1]	Own Community	30%	69%	93%	96%
	Other NSB Community	28%	31%	59%	58%
	NANA Community	12%	19%	31%	33%
	Anchorage	16%	18%	49%	50%
	Fairbanks	11%	8%	28%	31%
	Other Communities	5%	4%	21%	18%

[1] The 2003 averages for all North Slope communities include all communities except Utqiaġvik; sample size for Utqiaġvik was not available for the 2003 study year.

Sources: Shepro et al. 2003; Shepro et al. 2011; NSB 2016b

In 2015, the most recent NSB census, certain communities showed an increase or decrease under certain sharing categories when compared to 2010—these changes may simply reflect annual variations where communities send bowhead whale products based on the whaling community's harvest success and reported need in other non-whaling communities. In Kaktovik, the percentage of households sharing to Anchorage increased from 12 percent in 2010 to 42 percent in 2015. Point Hope sharing to NANA communities, Anchorage, and Fairbanks also increased. Nuiqsut sharing to Anchorage and Fairbanks decreased somewhat between 2010 and 2015 but still remained well above 1998 and 2003 levels. Similarly, Point Lay sharing to NANA communities and Anchorage decreased. Overall, however, the percentages of households sharing outside their communities across the North Slope stayed similar or increased between 2010 and 2015. On average across all North Slope communities for the 2015 time period, 96 percent of households reported sharing within their own community; 58 percent with other NSB communities; 33 percent with NANA communities; 50 percent with Anchorage, and 31 percent with Fairbanks (Table 12). Approximately 18 percent shared to other communities in Alaska or outside Alaska. Kofinas et al. (2016) recently documented sharing networks in Wainwright and Kaktovik, including subsistence sharing destinations outside one's community. For these two communities, researchers documented 34 different sharing destinations for the previous 12 months, represented by 1,572 "gifting occasions." These sharing destinations are listed in Table 13 and shown (with number of recipient households) on Figures 6 and 7. As shown in Figures 6, Kaktovik had out ties with 46 Fairbanks households, 29 Anchorage households, and 33 households in other non-whaling Alaska communities. Wainwright had out ties with 51 Anchorage households, five Fairbanks households, and 60 households in other non-whaling Alaska communities.

Table 13: Alaska Sharing Destinations by Wainwright and Kaktovik Households, Previous 12 Months

Sharing Destinations by Wainwright and Kaktovik Households, Previous 12 Months	
Aklavik	Kotzebue
Anaktuvuk Pass	Koyuk
Anchorage	Nikiski
Anderson	Ninilchik
Anvik	Nome
Atqasuk	Nuiqsut
Utqiaġvik	Perryville
Beaver	Point Hope
Bethel	Point Lay
Delta Junction	Red Devil
Fairbanks	Selawik
Fort Yukon	Unalakleet
Huslia	Wainwright
Inuvik	Wasilla
Kaktovik	Wiseman
Kenai	
Kivalina	

Source: Kofinas et al. 2016

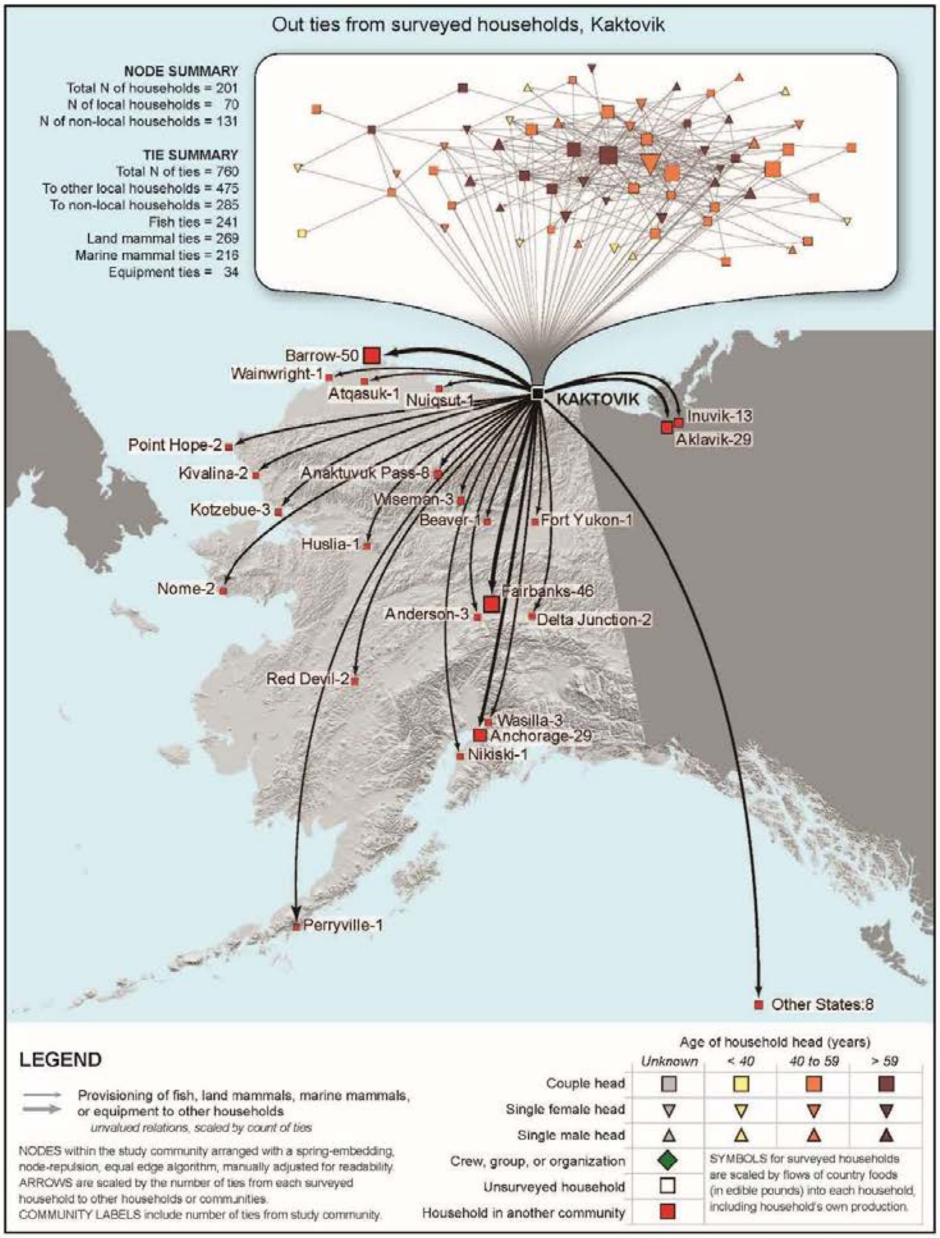


Figure 6: Out Ties from Surveyed Households, Kaktovik (Kofinas, BurnSilver, and Magdanz 2016)

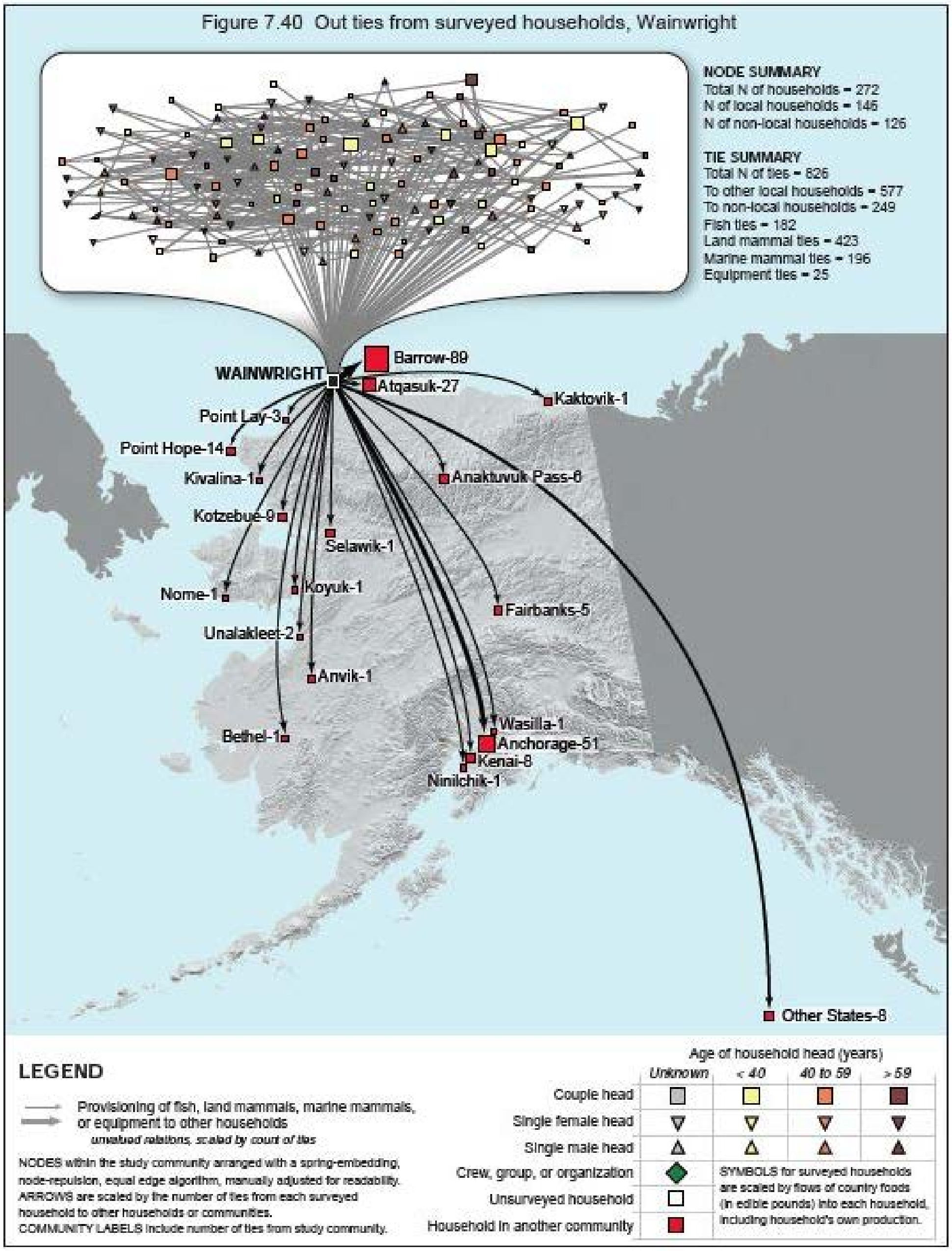


Figure 7: Out Ties from Surveyed Households, Wainwright (Reproduced from Kofinas et al., 2016)

The Kofinas et al. (2016) study focused on inflows of subsistence foods and contributions (e.g., supplies, money) into each household, either from other community households or from other communities. Interestingly, the study documented substantial bowhead inflows into Kaktovik and Wainwright from non-whaling communities, many of which represent contributions of equipment, supplies, and labor by non-whaling community residents to whaling crews in return for bowhead whale shares (Kofinas et al. 2016). Kaktovik bowhead whale relations show 55 inflow ties from Anchorage; Wainwright bowhead whale relations show 79 inflow ties from Anchorage, 17 from Anaktuvuk Pass, one from Kenai, and one from Newhalen. Venetie data from the same study provide an example of subsistence inflows for a rural, non-whaling community. In the case of bowhead whale, Venetie households reported a total of 17 sharing ties and a total inflow of 2,194 pounds of bowhead whale.

Data from the 1984 (Alaska Consultants, Inc. and SRB&A 1984) subsistence study and the NSB census provide information on direct sharing from households to other individuals or households. As discussed in the previous section ("Distribution of Bowhead Whales), community feasts and special occasions constitute another major form of sharing within Alaska Eskimo whaling communities. As stated in the 1984 report, "concentrated bowhead sharing occurs at the Whale Feast in Gambell and Savoonga, or *Nalukataq* (Blanket Toss) in the other villages, Thanksgiving, and Christmas feasts" (Alaska Consultants, Inc. and SRB&A 1984). As discussed above, while it is known that substantial quantities of whale products leave Alaska Eskimo whaling communities with festival attendees from other whaling and non-whaling communities, it is difficult to accurately quantify or characterize this distribution.

A third source of sharing data is the ADF&G Community Subsistence Information System (CSIS). The CSIS provides data from household harvest surveys conducted by the ADF&G Division of Subsistence. ADF&G's household harvest surveys typically include questions about the giving and receiving of different subsistence resources (e.g., percentage of households receiving and giving bowhead whales). The ADF&G surveys also include information on use of subsistence resources. The study team compiled available data regarding the use of bowhead whale by whaling and non-whaling communities. In some cases, data on the percentage of households receiving bowhead were not available, but data on the percentage of households using bowhead were available. The study team chose to use data on using bowhead whales as a proxy for receiving bowhead whales to expand the data set; in general, the percentage of households using and receiving bowhead whales in non-whaling communities is identical or nearly identical. In all, data on using bowhead whale were available for 105 Alaskan communities from 10 of the 11 ADF&G subsistence regions; one region (Aleutian) had no data on the use of bowhead whales. ADF&G's 11 subsistence regions are as follows (see Figure 8 for regional boundaries):

1. Aleutians
2. Bristol Bay
3. Eastern Interior
4. Kodiak
5. North Slope
6. Northwest Arctic
7. Seward Peninsula
8. Southcentral
9. Southeast
10. Western Interior
11. Yukon-Kuskokwim Delta

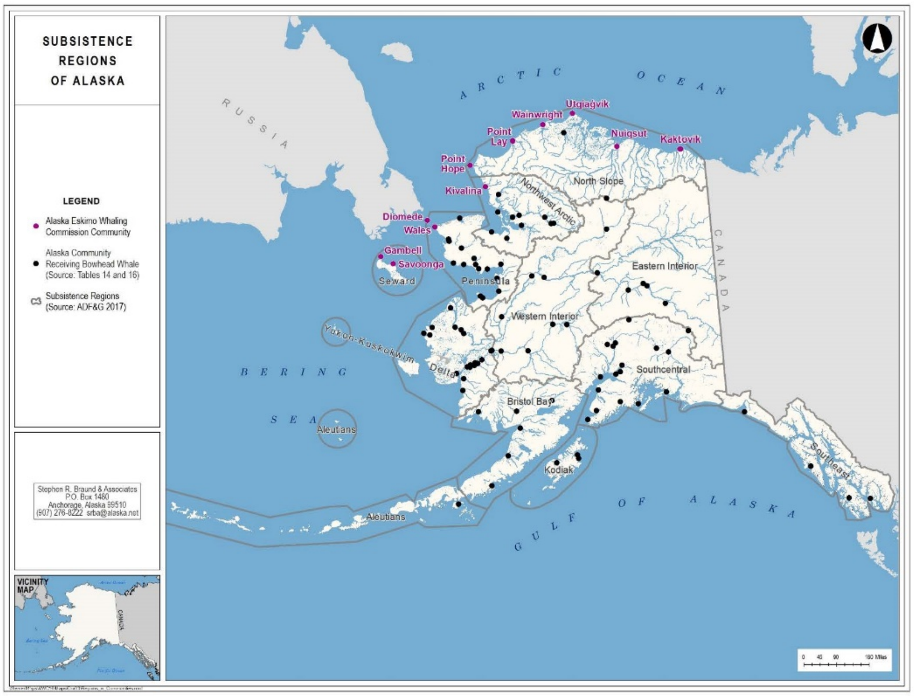
Table 14: List of 68 ADF&G Study Communities Using Bowhead Whale – Any Study Year[4]

Subsistence Region	Community Name
Bristol Bay	Chignik Bay
	Ekwok
	South Naknek
Eastern Interior	Tanana
Kodiak	Kodiak City
	Larsen Bay
	Ouzinkie
North Slope	Anaktuvuk Pass
	Utqiaġvik
	Kaktovik
	Nuiqsut
	Point Lay
	Wainwright
Northwest Arctic	Ambler
	Deering
	Kiana
	Kivalina
	Kobuk
	Kotzebue
	Noatak
	Noorvik
	Selawik
	Shungnak
Seward Peninsula	Brevig Mission
	Golovin
	Shishmaref
	Wales
Southcentral	Cantwell
	Chase
	Chenega
	Cordova
	Fritz Creek
	Glennallen
	Lake Louise
	Mentasta Pass
Southcentral (cont.)	Nanwalek
	Petersville Road
	Seward
	Talkeetna
	Trapper Creek
	Tyonek
Southeast	Klawock
	Yakutat
Western Interior	Aniak
	Eek
	Evansville
	Galena
	Grayling
	McGrath
	Nikolai
	Nulato
	Pilot Station
	Quinhagak
	Red Devil
	Scammon Bay
	Tuntutuliak
	Upper Kalskag
Yukon-Kuskokwim Delta	Akiachak
	Akiak
	Bethel
	Emmonak
	Kwethluk
	Lower Kalskag
	Mountain Village
	Napakiak
	Napaskiak
	Oscarville
	Tuluksak
Aleutians	No data

ADF&G 2017

[4] This table includes only communities for which there are ADF&G data. For example, in the North Slope Region, other communities, data are only available for "whale."

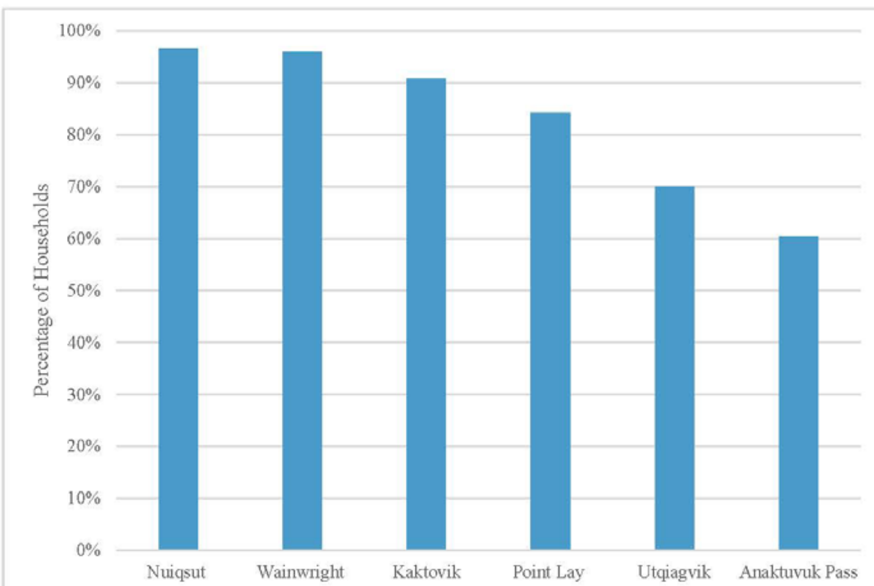
Figure 8: Alaska Communities Receiving Bowhead Whale and Subsistence Regions of Alaska



In 68 (65 percent) of the 105 communities with available data, households reported using or receiving bowhead whale during at least one study year (Table 14)[5]. Data for the remaining 37 communities indicate zero households using bowhead whale. No communities in the Aleutian region had data on the use of bowhead whales, and only one community in the Eastern Interior region had data (i.e., ADF&G did not ask households in these regions about their use of bowhead whales). Only ADF&G study communities are included in Table 14, and a number of communities who use bowhead whale are not included as ADF&G has not conducted household surveys in all communities. For example, on the North Slope, ADF&G data on use of bowhead whales are currently only available for six communities; however, numerous studies have well established that all eight North Slope communities use bowhead whale. Finally, in some communities ADF&G has documented use of "whale" without providing data on the species of whale being used. It is likely that in some cases this includes bowhead whale; however, these communities are not included in this analysis.

After compiling the available ADF&G data on use of bowhead whales, the study team calculated the average percentage of households using bowhead whale for each community across all study years (1982-2014); this analysis included all 68 communities with available data on the use of bowhead whales (excluding communities that have been asked about their use of bowhead and reported zero). The percentage of households using bowhead whale, by community are shown on Figure 9 through Figure 17.

Figure 9: Percentage of Households Using Bowhead Whale – North Slope[6]



[5] This table includes only communities for whom ADF&G has conducted comprehensive household surveys and where ADF&G specifically asked respondents about household use of bowhead whale. The number of communities using bowhead whale is therefore higher than what is shown in the table.

[6] This and subsequent figures include only communities with data showing household use of bowhead whales.

Figure 10: Percentage of Households Using Bowhead Whale – Northwest Arctic

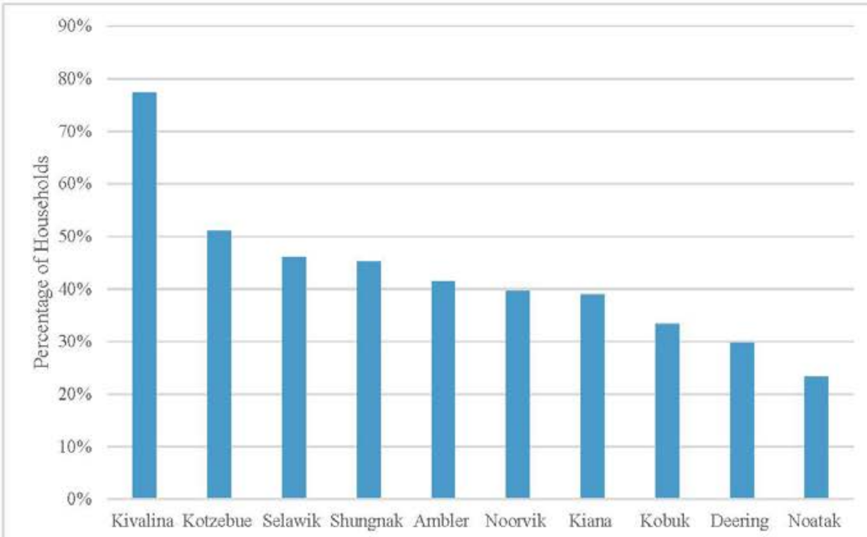


Figure 11: Percentage of Households Using Bowhead Whale – Seward Peninsula

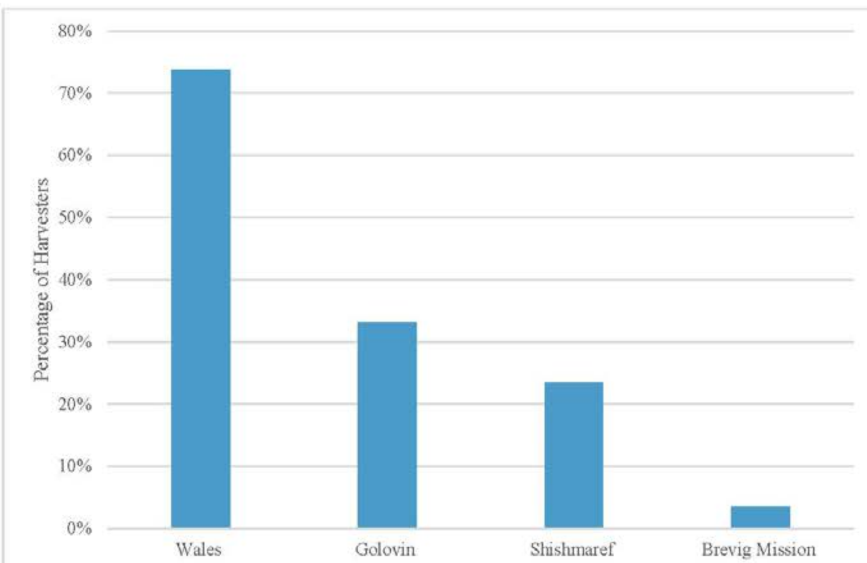


Figure 12: Percentage of Households Using Bowhead Whale – Western and Eastern Interior Communities[7]

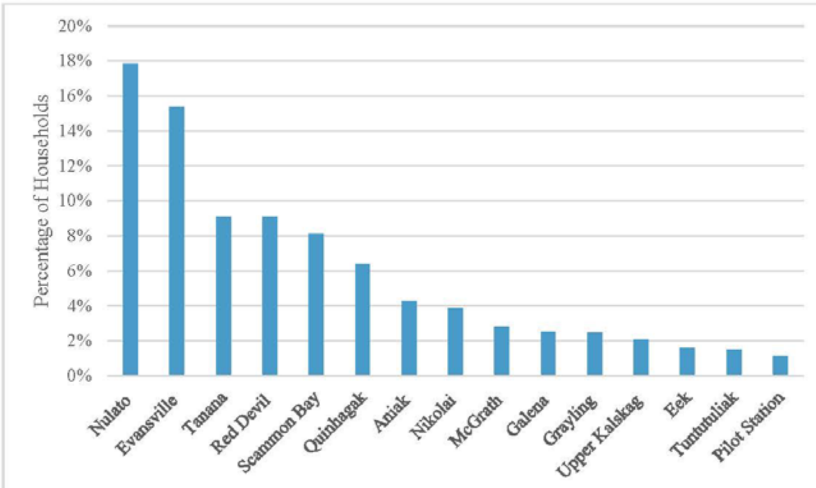
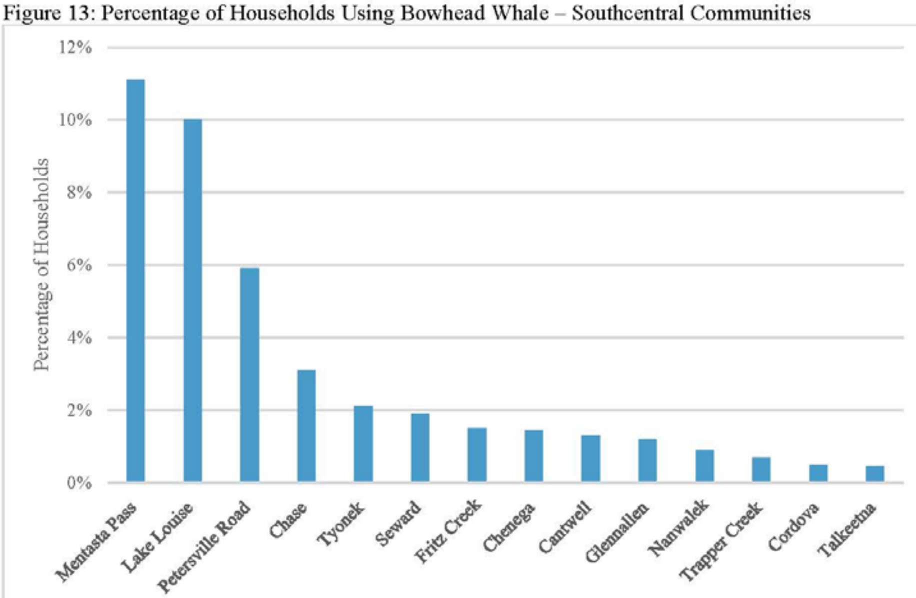


Figure 13: Percentage of Households Using Bowhead Whale – Southcentral Communities



[7] Because data were available for only one Eastern Interior community (Tanana), the Eastern and Western Interior regions were combined into one figure.

Figure 14: Percentage of Households Using Bowhead Whale – Yukon-Kuskokwim Communities

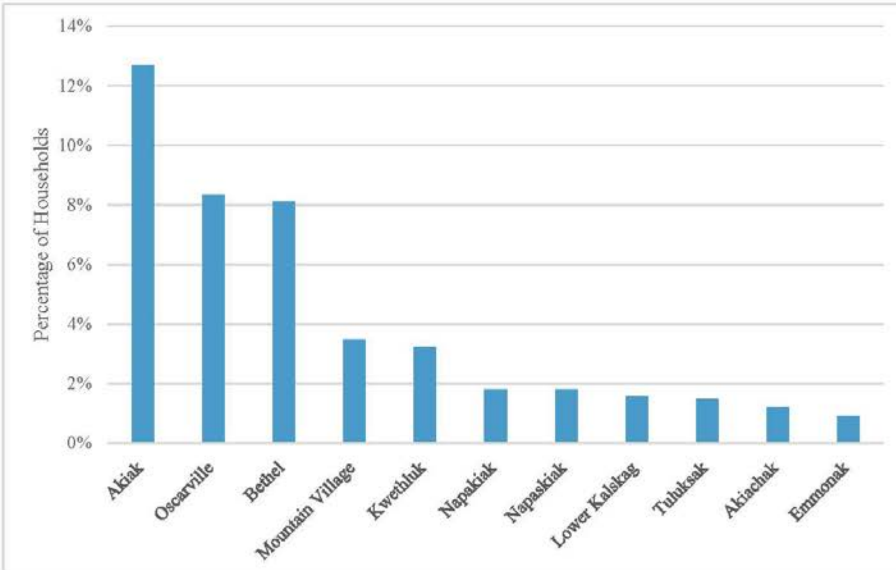


Figure 15: Percentage of Households Using Bowhead Whale – Bristol Bay Communities

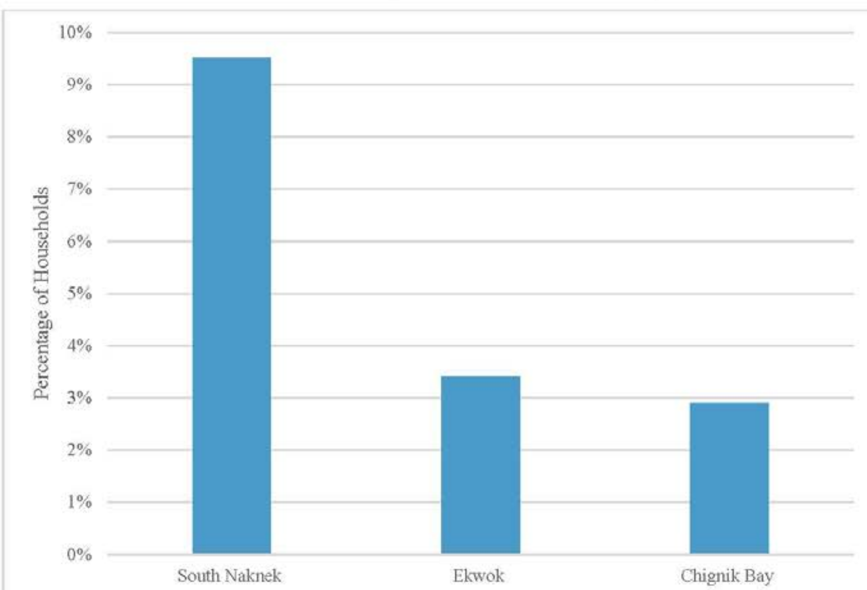


Figure 16: Percentage of Households Using Bowhead Whale – Kodiak Communities

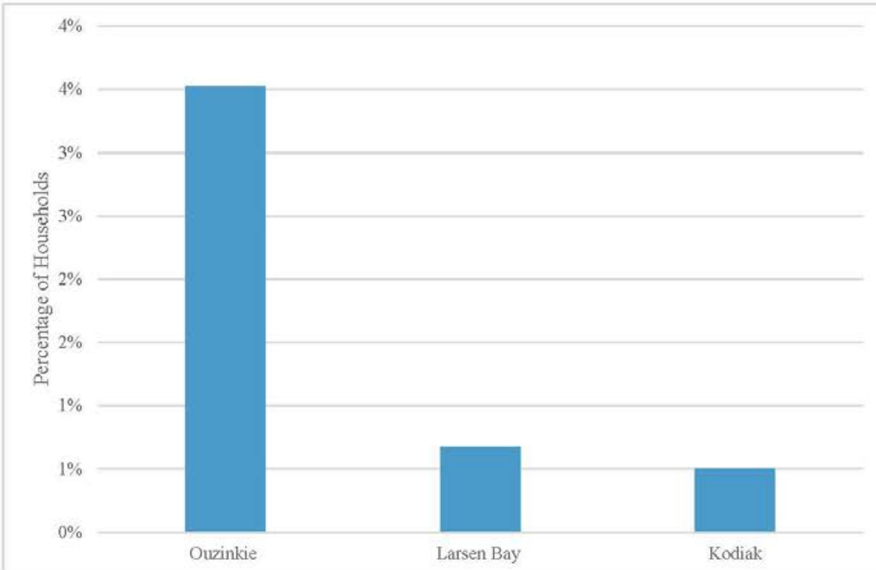
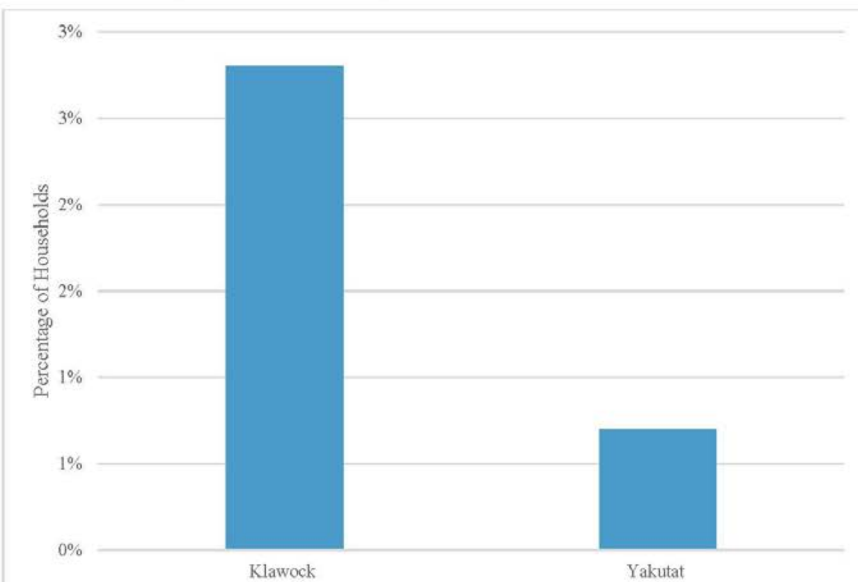


Figure 17: Percentage of Households Using Bowhead Whale – Southeast Communities



North Slope communities had the highest rate of households using bowhead whales, followed by Northwest Arctic communities, and Seward Peninsula communities. A relatively lower percentage of households in communities of the Bristol Bay, Kodiak, Southcentral, Southeast, Western Interior, and Yukon-Kuskokwim communities reported using bowhead whale. It is noteworthy that none of these latter six regions of Alaska, in which communities reported using bowhead whale, conduct bowhead whale hunting.

Sharing of bowhead whales between Alaska Eskimo whaling communities occurs both within and across regions. For example, communities in the Seward Peninsula Region do not just receive bowhead whale from Wales, Diomede, Gambell, and Savoonga, but also from communities in the North Slope and Northwest Arctic regions. Although data specifically on the use of bowhead whales are not available for Atqasuk, a 2012 ADF&G harvest survey in the non-bowhead whaling community of Anaktuvuk Pass shows 52 percent of households using whale, a majority of which was likely bowhead whale received from other North Slope whaling communities, and a more recent (2014) survey shows 60 percent of Anaktuvuk Pass households using bowhead whale. These data reflect the sharing from North Slope whaling communities to Anaktuvuk Pass that was reported during interviews conducted for this project.

After compiling available ADF&G data and calculating the average percentage of households using bowhead whales for each community, the study team used the most recent U.S. Census data for each community with available data to estimate the number of Native individuals who potentially use bowhead whales. Because the purpose of this analysis is to estimate current use of bowhead whales by individuals living outside Alaska Eskimo whaling communities, the average percentage of households using bowhead whales is applied to the most current population levels for each of those communities, rather than the population levels reported at the time of each ADF&G study (which range from the 1980s through the 2010s). This is based on the assumption that the percentage of households using bowhead whales has at least remained the same over time, although data from the NSB indicate that sharing outside whaling communities (in terms of percentage of households sharing outside their community) has in fact increased.

Based only on information for communities with available data, the study team estimated that 3,604 Natives from 61 non-whaling communities (outside of the approximately 700 households in 11 bowhead whaling communities based on 2010 census data) have used and likely continue to use, bowhead whale (Table 15). This estimation was calculated by first multiplying the estimated number of households using bowhead in a community by the average household size and then multiplying that value by the percent of Native residents within that community. Data on percent of households using are not available for Anchorage, Fairbanks, and other large communities (e.g., Dillingham, Eagle River, Kenai, Ketchikan, Sitka, Wasilla) where SRB&A learned bowhead was sent. ADF&G generally focuses its research in rural rather than urban areas, as rural areas are more likely to depend on subsistence resources. However, ADF&G has also in some cases focused its research on areas of potential development due to the need for baseline information, and these have often been road-connected communities.

Table 15: Estimated Households Using Bowhead Whale – Non-Whaling Communities

Community	2010 Population	2010 Number of HH	Average HH Size	Average Percentage HH Using	Estimated Number HH Using	Percent Native Residents	Number of Native Residents	Estimated Number of Native People Using
Kotzebue	3,201	954	3.4	51%	487	81%	2,588	1,322
Selawik	829	186	4.5	46%	86	96%	792	366

Community	2010 Population	2010 Number of HH	Average HH Size	Average Percentage HH Using	Estimated Number HH Using	Percent Native Residents	Number of Native Residents	Estimated Number of Native People Using
Bethel	6,080	1,896	3.2	8%	152	71%	4,334	345
Noorvik	668	153	4.4	40%	61	96%	638	257
Anaktuvuk Pass	324	99	3.3	60%	59	92%	298	179
Kiana	361	101	3.6	39%	39	93%	336	131
Shishmaref	563	141	4.0	24%	34	96%	540	130
Noatak	514	114	4.5	23%	26	97%	499	115
Shungnak	262	62	4.2	45%	28	94%	247	111
Ambler	258	75	3.4	42%	32	88%	228	95
Golovin	156	49	3.2	33%	16	95%	148	49
Kobuk	151	36	4.2	33%	12	90%	136	45
Nulato	264	92	2.9	18%	17	95%	250	45
Quinhagak	669	165	4.1	6%	10	97%	650	39
Akiak	346	90	3.8	13%	12	95%	328	43
Scammon Bay	474	96	4.9	8%	8	100%	472	38
Deering	122	44	2.8	30%	13	91%	111	33
Mountain Village	813	184	4.4	3%	6	95%	773	23
Kwethluk	721	172	4.2	3%	5	98%	703	21
Tanana	246	100	2.5	9%	9	89%	220	20
Aniak	501	166	3.0	4%	7	79%	397	16
Seward	2,693	928	2.9	2%	19	23%	616	12
Klawock	755	297	2.5	3%	9	59%	446	13
Brevig Mission	388	93	4.2	4%	4	94%	366	15
Mentasta Lake	112	46	2.4	11%	5	77%	86	9
Galena	470	190	2.5	3%	6	69%	324	10
Napaskiak	405	94	4.3	2%	2	97%	393	8
Akiachak	627	150	4.2	1%	2	96%	603	6
Emmonak	762	185	4.1	1%	2	97%	737	7
Napakiak	354	96	3.7	2%	2	97%	344	7
South Naknek	79	35	2.3	10%	4	84%	66	7
McGrath	346	147	2.4	3%	4	56%	192	6
Ouzinkie	161	56	2.9	4%	2	87%	140	6

Community	2010 Population	2010 Number of HH	Average HH Size	Average Percentage HH Using	Estimated Number HH Using	Percent Native Residents	Number of Native Residents	Estimated Number of Native People Using
Pilot Station	568	121	4.7	1%	1	98%	558	6
Oscarville	70	15	4.7	8%	1	96%	67	5
Tuntutuliak	408	96	4.3	2%	2	97%	396	8
Chenega	76	31	2.5	1%	0.3	61%	46	0
Tuluksak	373	92	4.1	1%	1	96%	357	4
Lower Kalskag	282	75	3.8	2%	2	97%	274	5
Grayling	194	55	3.5	2%	1	93%	181	4
Upper Kalskag	210	60	3.5	2%	1	92%	193	4
Eek	296	91	3.3	2%	2	98%	289	6
Kodiak	6,130	2,039	3.0	1%	20	10%	592	6
Ekwok	115	37	3.1	3%	1	95%	109	3
Nikolai	94	37	2.5	4%	1	93%	87	3
Tyonek	171	70	2.4	2%	1	95%	162	3
Cordova	2,239	922	2.4	1%	9	15%	344	3
Fritz Creek	1,932	848	2.3	2%	17	6%	121	2
Yakutat	662	270	2.5	1%	3	36%	235	2
Larsen Bay	87	34	2.6	1%	0.3	76%	66	1
Nanwalek	254	55	4.6	1%	1	89%	227	2
Red Devil	23	12	1.9	9%	1	83%	19	2
Chignik Bay	91	41	2.2	3%	1	62%	56	2
Evansville	15	12	1.3	15%	2	53%	8	1
Glennallen	483	203	2.4	1%	2	18%	86	0.9
Trapper Creek	481	225	2.1	1%	2	11%	54	0.5
Cantwell	219	104	2.1	1%	1	21%	45	0.5
Petersville Road	4	4	1.0	6%	0.2	25%	1	0.1
Talkeetna	876	449	2.0	0.5%	2	6%	56	0.2
Lake Louise	46	25	1.8	10%	3	2%	1	0.1
Chase	34	18	1.9	3%	1	0%	0	0.0
Total	**41,108**	**13,333**			**1,256**		**23,631**	**3,604**

Field Data on Sharing Outside Alaska Eskimo Whaling Communities

Up to this point, this report has relied *primarily* on the existing literature, supplemented by respondent observations, to characterize the history of bowhead whaling, Alaska Eskimo demographics, the importance of bowhead whale and sharing in Alaska Eskimo culture and society, methods of bowhead whale distribution, and overall percentages of households sending or receiving bowhead whale across the State of Alaska and beyond. Interviews with whaling captains and crew members conducted for this study provided qualitative insight on the nature of sharing outside whaling communities. The following is a summary that focuses on the results of interviews and workshops conducted for this study in the seven study communities.

Distribution of Bowhead Whale Outside Communities

Based on discussions with the 65 whaling captains, co-captains, and crew members interviewed for this study, during their most recent active whaling year, captains and crew member respondents routinely send bowhead to 63 different communities in Alaska (Table 16). Considering the limited number of interviews and workshops conducted for this study, the lack of a representative sample, and the inability to track secondary sharing, the number who received bowhead whale is likely substantially higher than what is reported in Table 16.

Table 16: Reported Bowhead Whale Sharing Destinations, Seven AEWC Whaling Communities

Alaska Recipient Community	ADF&G Region
Ekwok	Bristol Bay
Nondalton	
Pilot Point	
Sand Point	
Togiak	
Delta Junction	Eastern Interior
Fairbanks	
Nenana	
North Pole	
Kodiak	Kodiak
Ouzinkie	
Anaktuvuk Pass	North Slope
Atqasuk	
Utqiaġvik	
Kaktovik	
Nuiqsut	
Point Hope	
Point Lay	
Ambler	Northwest Arctic
Buckland	
Deering	
Kiana	
Kivalina	
Kobuk	
Diomede	Seward Peninsula, cont.
Elim	
Gambell	
Golovin	
Koyuk	
Mary's Igloo	
Nome	
Shaktoolik	
Shishmaref	
Solomon	
St. Michael	
Stebbins	
Teller	
Unalakleet	
Wales	
White Mountain	
Anchorage	Southcentral
Eagle River	
Kenai	
Wasilla	
Hoonah	Southeast
Juneau	
Ketchikan	
Sitka	

Alaska Recipient Community	ADF&G Region
Kotzebue	
Noatak	
Noorvik	
Selawik	
Shungnak	
Savoonga	
Brevig Mission	Seward Peninsula
Council	

Alaska Recipient Community	ADF&G Region
Nulato	Western Interior
Bethel	
Chevak	
Hooper Bay	Yukon- Kuskokwim Delta
Kalskag	
Scammon Bay	
St. Mary's	

In Year 1 of this study, data on sharing activities for the previous year were collected for individual whaling captains. Based on those data, 96 percent of whaling captains shared bowhead whale with relatives and individuals with whom they share social ties outside their home communities.

In Nuiqsut and in all the Phase 2 study communities (Gambell, Savoonga, Wainwright, and Point Hope), study team members asked whaling captains to estimate approximately what proportion of bowhead whale products leave their community in a year. The question was not asked in Utqiaġvik due to the larger number of whales harvested and because of the longer span of the whale season which consists of both a spring and fall hunt; in Kaktovik, respondents were unable or did not want to come up with an estimate. Among the communities who did provide an estimate, the similarities were notable. Whaling captains in Nuiqsut estimated that between one-quarter and one-third of the annual bowhead harvest is sent outside of their community. Point Hope captains—who had just harvested their maximum quota of 10 whales—estimated that three to four of those 10 whales would leave the community, and that this percentage (30 to 40 percent) is the same every year, regardless of how many whales are harvested. Similarly, whaling captains in Gambell and Wainwright estimated that approximately one-quarter of the whales they harvest leave their communities, while whaling captains in Savoonga provided a somewhat higher estimate of between 30 and 50 percent.

Whaling captains in Savoonga estimated that, on top of the approximately 1,600 individuals living on St. Lawrence Island, another 800 (i.e., approximately 1/3) St. Lawrence Island relatives live off the island. If true, this would support the estimate that over one-third of harvested whales leave the island to support those individuals with kinship ties. Similarly, Point Hope whaling captains noted that while the community population is around 800 people, there are approximately 1,500 shareholders in their village corporation—the Tikiġaq Corporation—and most of these individuals maintain ties with their home village and use bowhead whale. Finally, in Wainwright, one whaling captain questioned whether the original quota took into account whale products shared during whaling feasts in addition to direct sharing outside the community, noting, "Because, if you count all those other people that use whale, then our population basically doubles!" (Wainwright Whaling Captains Association Meeting March 2017).

The estimates by whaling captains regarding the proportion of whale that leaves their communities (one-quarter to one-half of the annual bowhead harvest leaving the community) are consistent with the study team findings that a substantial amount of distribution occurs during whaling feasts and festivals; and numerous non-whaling communities use bowhead whale (as documented by ADF&G and during interviews and workshops conducted for this study.

The majority of information provided in this section is based on interviews and workshops with whaling captains, and therefore reported sharing destinations (see Table 16) are primarily based on whaling captains alone. However, in addition to captains sending bowhead whale outside the community from their captains' shares and personal shares, discussions with others in the community, including both crew members and non-crew community members, documented that these individuals also share bowhead with family and friends living outside the community, and therefore the number of communities receiving bowhead whale is higher than those reported in Table 16. For example, one Kaktovik resident reported to a study team member that she regularly sends *maktak* to her son living in the Bristol Bay region. In addition, as reported earlier, NSB 2015 census data show that on the North Slope, 33 percent of households sent subsistence foods to the NANA region, 50 percent of households sent subsistence foods to Anchorage, and 31 percent of households sent subsistence foods to Fairbanks. It can be assumed, based on earlier data that show a substantial percentage of households sharing bowhead whale outside their communities (Table 10 through Table 12), that bowhead was among the subsistence foods that were shared by these households in 2010 and that a majority of these households are not captains' households.

As noted earlier in this report, community feasts such as *Nalukataq*, *Qagruk,* Thanksgiving, Christmas, and other special occasions (e.g., AEWC mini-conventions) are another source of distribution outside of one's community. Friends and family from other regions of Alaska often attend these community feasts, receive shares of bowhead meat and *maktak,* and then return to their home regions with these shares. It is difficult to adequately quantify the amount of bowhead that leaves a community after a community feast, as one would need to systematically document how many non-locals are in attendance at one of these feasts and the size of each share received. In addition, non-local attendance at a feast varies from community to community and from captain to captain. At a *Nalukataq* in Kaktovik attended by the study team, key informants indicated that they did not know how many outsiders would be in attendance, and reported that the majority of the attendees at Kaktovik feasts are from the community itself. One individual suggested that this may be due to the relatively remote nature of Kaktovik and the costs of traveling to and from that community when compared to a larger community such as Utqiaġvik, where, as noted above, upwards of 600 people attended a 2004 *Nalukataq*. Utqiaġvik whaling captains who described *Nalukataq* in their community reported a greater non-local presence from various regions of the state. One captain estimated, "15-16 people from Kotzebue to Utqiaġvik; people from the NANA region; eight to 10 from Fairbanks; and a bunch [of people] from Anchorage" and then added that at his last *Nalukataq* there were also attendees from North Pole and Nulato (Utqiaġvik Whaling Captain Interview March 2016). This same captain reported sending 270 pounds of bowhead home with Kivalina attendees at the most recent AEWC mini-convention and indicated that individuals from Little Diomede and Wales also received shares of bowhead at the mini-convention and returned home with those shares. Finally, at the 2017 Point Hope *Qagruk,* whaling captains estimated that approximately 300 people had traveled to the community to partake in the festivities, and all of these individuals had received and returned home with bowhead whale products. Two days after the festival, festival participants were continuing to trickle out of the community on multiple daily flights, bringing totes of bowhead with them on the plane. As stated above, one festival participant estimated her family would be returning home with approximately nine 50-pound shares of bowhead. Even if each of the 300 participants left with a single 50-pound share, the amount leaving the community after a single *Qagruk* would have been approximately 15,000 pounds – roughly the edible weight of a 30-foot whale (SRB&A and ISER 1993b).

Factors that Affect Sharing Outside the Community

The amount shared outside the community per captain varies between communities. Discussions with individuals in each community provide some context as to why some communities may distribute more outside their community than others. Based on these discussions, there emerged several factors that facilitate or limit sharing of bowhead whale outside of a whaling community: 1) number of whales harvested; 2) size of individual crew shares; 3) freight costs (or financial means) and ease of travel to and from one's community; and 4) proximity to other non-whaling communities. Each of these factors are discussed in further detail in the following sections.

Number of Whales Harvested

The first and most obvious factor that affects how much and whether bowhead whale is shared outside a community is the number of whales successfully harvested in a given year. The amount one shares is directly related to the amount one harvests; in general, the more one harvests, the more one shares (Kofinas et al. 2016). Regardless of the amount an individual or whaling crew harvests, there is always a household or community in need, with whom one can share.

A number of whaling captains noted that the amount they share varies depending on the number of whales harvested, but stressed that the *proportion* generally remains the same. They also indicated that the overall sharing network remains the same regardless of how many whales are harvested—in other words, they send shares to the same individuals in the same communities, with the size of the share varying depending on the success of the harvest. They also noted that requests for bowhead from individuals living outside the community are more frequent when the community harvests a large number of whales. When asked if their sharing decreases if they harvest fewer whales, one individual referenced the commonly held view that sharing one's harvest results in greater future success, saying, "NO. These people really believe that the more you give, the more you get" (Savoonga Whaling Captains Association Meeting March 2017). Another whaling captain in Wainwright made a similar observation that while the pounds of shared bowhead may decrease or increase depending on the number of whales harvested, the overall percentage remains the same:

> *I think still about 25 percent would still be shared out (if we only harvested one whale), but everyone would just get a smaller amount. If I have four slabs of maktak then I give 25 percent away, if I have one slab then maybe just a quarter of that slab. You practically send the same percentage every year.* (Wainwright Whaling Captains Association Meeting March 2017).

Size of Shares

The size of an individual crew share depends on the size of the whale, the number of crews assisting with that whale, and the size of each crew. Therefore, in general, the more crews a community has and the greater size of those crews, the smaller an individual share is for each whale harvested, and vice-versa. Comparing share sizes between Utqiaġvik and Nuiqsut, can provide an example of two ends of this spectrum. In Utqiaġvik in 2015, there were 51 registered whaling crews and 25 whales harvested. As discussed earlier, Utqiaġvik whaling captains often send representatives from their crew to assist in butchering a whale so that their crew members can receive a boat share, which is further distributed by each crew member. In his research on the distribution of bowhead whale in Utqiaġvik, Kishigami (2013a) documented one instance in which 16 crews assisted with a single whale (and each of those crews received a boat share). Conversely, in 2015, Nuiqsut had four active whaling crews (seven were registered, but three did not launch their crews in 2015) totaling an average of 27 active whalers on Cross Island throughout the season (Galginaitis 2016). Each of those four crews received a share from each of the three whales harvested in 2015.

Thus, individual crew member shares in Utqiaġvik are smaller than individual crew shares in Nuiqsut, which can affect sharing behaviors. While a crew member in Utqiaġvik could receive a similar quantity of shares as a crew member in Nuiqsut, the time and effort required to obtain those shares is substantially higher, in that Utqiaġvik crews participate in 20 to 25 butcherings, and Utqiaġvik shares are obtained over two whaling seasons (spring and fall), compared to a single, discrete whaling season in Nuiqsut (fall whaling at Cross Island). As one Wainwright whaling captain put it, "I think when we get one whale, half of my share is what they [Utqiaġvik whalers] get for the whole season!" (Wainwright Whaling Captains Association Meeting March 2017). The same concept can extend to individual crews—crews with a higher number of crew members end up receiving smaller-sized shares. As one whaling captain in Gambell said,

> *Some [crews] have only one family in the boat. But they still share with relatives, their nieces, cousins, or whatever. Some boats have—I don't know how many crew members—so their share is very little when they distribute it out to the crew members.* (Gambell Whaling Captains Association Meeting 2017)

Based on discussions with Utqiaġvik whaling captains (who participate in spring and fall whaling), sharing behaviors in the spring are often affected by the "unknown" of how successful the upcoming fall season will be. One Utqiaġvik whaling captain touched on this when he noted how they take these things into consideration when deciding how to distribute their *Uati:*

> *If we are having a lean season and not many are caught, we will stay on a cautionary time. We have to make sure there is enough for* Nalukataq, *Thanksgiving, and Christmas, and then look to the fall – the changing environment, the ice – we take it all into consideration. Here is a springtime example. When my dad was getting close to retirement, me and [other family member] were starting to run the crew. Dad had not officially turned it over. In the springtime, only three crews had landed whales. We had to get ready for the whale feast –* Nalukataq. *We had to come together [and decide] 'How are we going to do this?' We knew we had thousands of people to feed and only three whales to do it. At the same time, we had to save for Thanksgiving and Christmas – should we depend on fall whales for Thanksgiving and Christmas, and feed more of the three whales during* Nalukataq*? We had to plan for this. We ended up distributing three-quarters or more of each whale for the springtime, just to have a decent* Nalukataq. (Utqiaġvik Whaling Captain Interview, March 2016).

This same captain noted that he sends out more of his personal shares when he is *not* successful, explaining, "When I am responsible for *Nalukataq* I am more 'conservative."

Freight Costs and Ease of Travel

Another factor that limits sharing, and which was frequently brought up by respondents, is the costs associated with sending bowhead outside of the community. These concerns were particularly prevalent during discussions with Kaktovik, Gambell, and Savoonga residents, but came up in all communities. Limiting factors include the costs of freight for shipping bowhead and the cost of travel (and associated baggage fees) associated with flying to and from ones' community. For example, costs of a roundtrip flight from Nuiqsut and/or Kaktovik to Anchorage are often over $1,000 and include baggage fees of at least $75 if traveling with baggage in excess of 50 pounds. Being the regional hub, flights to and from Utqiaġvik are generally less expensive.

Respondents' comments regarding the cost of shipping bowhead included the following:

> *If we hear of something [someone in need], my wife posts a thing on Facebook and whoever can spare something will send shares. Shipping costs limit how many people we can send shares to and how far.* (Utqiaġvik Whaling Captain Interview June 2016)

There's not enough to give out. Plus shipping is too expensive and the people [communities] don't help with costs. (Utqiaġvik Whaling Captain Interview May 2016)

It gets costly sending it out. The cost of freight is limiting. (Kaktovik Whaling Captain Interview June 2016)

The last few years, it's been harder because of freight. I would probably send more to Anaktuvuk Pass and Atqasuk if I could. The big problem is the freight; it's pretty expensive. I would like to trade with Anaktuvuk Pass for caribou. (Kaktovik Whaling Captain Interview June 2016)

If I can't afford to send whale meat out to other communities, then I might ask those communities to pay for the freight. (Utqiaġvik Whaling Captain Interview May 2016)

Very few times there was not enough money to send out to others due to high airline prices, especially if I'm wanting to send a large tote to Anchorage, but I can't think of any specific instances. (Nuiqsut Whaling Captain Interview May 2016)

Freight is unaffordable. It usually goes out when someone is traveling. (Savoonga Whaling Captains Association Meeting March 2017)

Once in a while when I can afford it, I send some maktak and walrus meat to Kalskag by express mail. I wrap it in insulation and four days later when it arrives there, it arrives frozen. But that's like 90 dollars for a 10 pound package. (Savoonga Whaling Captains Association Meeting March 2017)

The freight cost is so high, so they don't send much, even though they want to send double what they're sending. (Gambell Whaling Captains Association Meeting March 2017)

Regarding air freight, they [the recipient] pay the freight. We send it, and they pay. You do not pay the freight; they will, and they do not complain. (Wainwright Whaling Captains Association Meeting March 2017)

Quantities sent outside of the community often corresponded to maximum baggage weight limits, as residents often bring coolers or totes of bowhead products with them when flying to Fairbanks or Anchorage. In other cases, residents indicated that they only sent as much as they could afford when paying for freight. One Kaktovik captain noted that his limit is around 35 pounds per shipment, as 50 pounds is just too expensive to ship. The community of Nuiqsut has an alternative to shipping bowhead out which can help reduce costs; in the winter, residents have access to the Dalton Highway via ice roads. Respondents reported using the road system to transport *maktak* and meat to urban centers such as Fairbanks and Anchorage. In Gambell and Savoonga, residents noted that they often send packages of bowhead whale meat and/or *maktak* with individuals who are traveling outside of the community. Certain individuals travel frequently for work-related or other reasons and are accustomed to transporting such packages for community members. As one whaling captain said, "When I travel, people will ask me to take it with me and I'll take it to Anchorage…. If we have a good year, if they are having a public gathering, we will ship it [to the mainland]" (Savoonga Whaling Captains Association Meeting March 2017). In Point Hope, whaling captains noted that freight costs do not really factor into the amount sent outside the community and indicated that in some cases individuals offer to pay the freight COD (collect on delivery).

The ability to send bowhead out of the community is also closely related to a captain's income and financial means. Captains with higher paying jobs (and communities with more high-paying jobs available) may be more likely to send larger quantities of bowhead out of their community.

While sharing can be limited by factors such as freight costs and logistics, it is important to note that, in general, the increasing ease of travel to and from rural Alaska has facilitated greater sharing of bowhead whale outside Alaska Eskimo whaling communities. When the quota was first implemented in the 1970s, air travel to and from many whaling communities was infrequent and unreliable. Today, air strips have been upgraded and most communities see one to two regular flights daily, with additional flights scheduled during busy times as needed. Air carriers are generally accommodating to the needs of rural Alaskan residents; allowing transport of subsistence foods such as meat and *maktak*, for example, as long as it is frozen. After the conclusion of the 2017 *Qagruk*, the Point Hope air strip was busy with additional planes and routes carrying passengers, with bowhead, home throughout the NANA and North Slope regions.

Proximity to Other Communities

The likelihood that a community will send whale outside their community is also influenced by the proximity of that community to other nearby communities in need. Costs of shipping are reduced when one can transport a load of meat and *maktak* to another community by snow machine or boat. The communities of Nuiqsut, Utqiaġvik, Wainwright, and Point Hope are within reasonable boating or snow-machining distance to other communities and able, if desired, to directly transport bowhead whale to communities such as Atqasuk and Point Lay (in the case of Utqiaġvik and Wainwright), Anaktuvuk Pass (in the case of Nuiqsut), and Kivalina (in the case of Point Hope). In contrast, the communities of Kaktovik, Gambell, and Savoonga are more remote. For example, the distance between Utqiaġvik/Wainwright and Atqasuk, as the crow flies, is between 50 and 60 miles; between Nuiqsut and Anaktuvuk Pass is approximately 150 miles; and between Kaktovik and Anaktuvuk Pass (the nearest non-whaling community) is approximately 240 miles. Gambell and Savoonga are located on an island approximately 150 miles from any mainland community.

Future Considerations Regarding the Bowhead Whale Quota

Effects of Quota on Hunter Behavior

Until the 1970s, Alaska Eskimo whaling communities harvested whales without government regulation. Instead of adhering to a quota system imposed by outside entities, each community harvested whales as needed, adhering to their own cultural norms and rules regarding community need and the avoidance of waste. In essence, these communities self-regulated their bowhead harvests from time immemorial until 1977. While most whaling captains today believe that the current quota system is an appropriate method for managing bowhead harvests, some believe that the existence of a quota is unnecessary given their ability to self-manage their harvests. Regardless of their views on the necessity or appropriateness of the quota, whaling captains noted that the existence of a quota has affected the bowhead whale hunt through changes in hunter behavior. During discussions with whaling captains, the study team identified several ways in which the quota affects the bowhead whale hunt.

First, whaling crews may be less likely to target smaller whales because of concerns about harvesting enough meat. Although the smaller whales are easier to land and less likely to result in a struck and lost whale, and the meat and *maktak* are often preferred, whaling crews may target larger whales because they are concerned about having an adequate amount of meat and *maktak* to distribute throughout the community and beyond. Without a quota, it is possible that whaling crews would harvest a larger number of smaller whales. As a key informant in Savoonga explained,

> *Where I come from, my forefathers, they used to get 18 [whales] every year, just small ones. Not the big ones. Only for tools and toboggan would they get a big one, maybe one every year. They never used to hunt big ones. Just the small ones, tender ones. Lots has changed. Everyone wants to get a whale now. It changes the hunt, because of the quota. If there wasn't any quota, I would prefer we get the small ones.* (SRB&A Key Informant Interview Savoonga March 2017)

Another way in which the bowhead quota may affect hunter behavior is by causing riskier hunter behavior. Whaling captains noted that the pressure to land the community's quota—without losing a whale—can result in risky hunting behavior. Whaling crews may choose to stay on the water or push on despite marginal boating conditions:

> *A metaphor—a good metaphor to give the IWC—is a baseball game. You've got three strikes and you're out. Those guys gotta swing the bat, and they've got four balls. That would be a good explanation to IWC. You can't make a mistake out there on the ocean…. Late in the season, some captains push the weather envelope, when one isn't caught. There's some added pressure to catch the whale then, because the whales are going [by]. Some of these boats may go out in marginal conditions.* (Wainwright Whaling Captains Association Meeting March 2017)

> *Respondent 1: And then we lose whole families. One family, when they were towing a whale, the boat tipped over. They we were trying to come back but they didn't make it.*
> *Respondent 2: It was a Gambell boat. Those are bad risks [to take]. But they need to eat.* (Savoonga Whaling Captains Association Meeting March 2017)

Finally, some respondents noted the general pressure that a quota system places on whaling captains and crew members:

> *Of course, the major issue with whaling is the quota and regulations. It tends to – we're in some level of pressure to be successful. IWC's got a law. And the U.S. is on it, and there's some level of pressure to be successful. We're not as relaxed for hunting. It affects how we hunt, how we approach the whale, the dynamics of approaching the whale is affected.* (Gambell Whaling Captains Association Meeting March 2017)

> *Respondent 1: When you have a quota, you put a pressure on the captains and the whaling crews. They need a successful catch, instead of losing it. When you have that in your mental—it affects your decision making because you have to get that whale, and if you lose it, you lost a whale and a strike.*
> *Respondent 2: A lot depends on the strike—the striker decides [whether to strike]. The pressure is on the striker. At the last second, he is thinking "Quota, quota!"*
> *Respondent 1: It affects you, when you're sighting it, chasing the whale, throwing it [harpoon].*
> *Respondent 2: Or you don't even try it – he is ready to throw, and thinking "I got to get it right." It is optimum conditions, the whale's right there—and the striker might be thinking, "But what if I miss it, what if I mess up, what if I do it and miss the whale.*

That will cause a great deal of hardship." Sometimes the captain will say to the striker, "Why didn't you strike it, it was right there!" It is the striker that makes the decision. (Gambell Whaling Captains Association Meeting March 2017)

A quota that provides more room for a reasonable amount of error and allows for greater choice in the types of whales harvested could reduce some of the impacts of the quota system on hunter stress, behavior, and hunting efficiency. For more discussion of this topic, see the section below entitled *Reevaluation of Factors Affecting Need.*

Resource Trends/Availability

A community's need for bowhead whale is related to the availability of other wild resources. Alaska Eskimo communities rely on a diversity of resources to meet their nutritional and cultural needs, including marine mammals, terrestrial mammals, birds, fish, and vegetation. Recent years have seen either a decreased abundance—or availability—of certain subsistence resources. On the North Slope, the Central Arctic, Western Arctic, and Teshekpuk caribou herds have all seen declining numbers in recent years (Lawhead et al. 2015). In Gambell and Savoonga, residents report increasingly difficult conditions for harvesting walrus—while the consensus is that the walrus are abundant, ice and other conditions prevent residents from accessing them as they migrate past the community on the pack ice:

> *It used to be [we could harvest] four walrus in a trip. But with the ice—for the past three, four, five years, we haven't been getting any walrus. And we've been asking for disaster funds from state and federal. I work for the committee for marine mammals. We raised the quota to six walrus per trip, while they're still there [passing by the community]. It's like a one day hunt [where the per trip quota is higher].… We don't get that many now – maybe 30, 50 nowadays.* (SRB&A Key Informant Interview Savoonga March 2017)

In addition to walrus, residents of whaling communities have reported difficulty harvesting other marine resources such as bearded and ringed seal, due to changing ice conditions. While residents do not report an overall decline in the abundance of these resources, their availability within traditional harvest areas has decreased due to reduced ice cover. A number of whaling captains indicated that while the quota currently meets their community's needs, there may be a greater need for whales in the future if changing ice conditions result in non-bowhead resources becoming less available, or if the government imposes stricter harvest regulations on resources such as caribou and polar bear:

> *In the future, I think so [need more bowhead]. [Because of] food. You have to think of the other species that we eat as well. They talk about regulating the caribou at a lower level [of harvests], because of the current population estimates, which we think is bogus. But the regulations affect how much we can harvest. So, we will need something to supplement that. When we have years when we get fewer bowhead, we supplement with more caribou, ducks, fish…. The ADF&G is talking about limiting our caribou harvest; we're going to need something to replace it. At the store, a single steak is 32 bucks and that's only for one person, and you might have four people in your family. That's $150 for a meal. When you take that into consideration, more people tend to eat Native food than store-bought [food]. The trend of limiting our current hunting of different species is going to affect our need for bowhead. [Other concerns] include ice seals, polar bear, caribou—and think about other areas of the state where they're being more limited—they're going to be asking for MORE*

bowhead. All that taken into consideration, we're going to need more. (Wainwright Whaling Captains Association Meeting March 2017)

Caribou is less available these days. Even with polar bear – I eat a lot of polar bear, but if they started a quota [limiting polar bear harvests] we would probably need more bowhead. We get 10, 12 bears a year. The caribou haven't been coming by lately, but last year they finally did. We're still getting walrus, ugruk. The ugruk is declining though. This year they're healthy, but last year I had to throw a couple a way [because it was] jaundiced. (SRB&A Key Informant Interview Point Hope June 2017)

A number of individuals noted that increasing availability and abundance of bowhead whale may result in higher success rates for the resource in the future. In Gambell and Savoonga, whaling captains frequently brought up the increasing abundance of bowhead whales, particularly around St. Lawrence Island:

I think it [the quota] is adequate now, but you've got to look ahead to the future with the changing environment. I think down the road there are going to be more opportunities because there will be more whales. In '65 to '70, there were whales around all summer. In the past there were many settlements around the island, and pretty much every settlement around the island has whale bones. Not all bowhead—gray whales, [humpback]whales—and now we're starting to see them back again. (Savoonga Whaling Captains Association Meeting March 2017)

Another factor that can affect the availability of certain resources is regulations. Residents in Savoonga noted that while there is an abundance of various resources near their island, many of them are off-limits to local hunters:

There's enough food out there—we just can't get to it. Whether it be regulations or ice. We don't have a quota of gray whales, minke whales, humpbacks. Local ordinances for walrus limit you. You can't take more than four and bring them home. They set that limit way back when these people were young. In 1945, when the IRA got established. (Savoonga Whaling Captains Association Meeting March 2017)

While whaling captains indicated that current quotas generally allow for adequate harvests to meet community need, they stressed that future assessments should take into account the need for bowhead whale in the context of other resource trends.

Other Issues Facing Alaska Eskimo Whaling Communities

In addition to the effects of the quota on hunter behavior and changes in resource availability, whaling captains brought up a number of other issues which affect their ability to meet their community's bowhead quota. These include poor or worsening hunting conditions related to ice, weather, and climate change; and disturbance from industry and commercial activity. Whaling captains note that ice and weather conditions are primary factors in determining their success each year. In 2017, when Point Hope struck and landed their entire quota (10), whaling captains attributed their success to ideal ice conditions:

When the ice is too thin, we won't even bother whaling because we don't want to waste a whale. It's ice conditions and weather. Ice conditions is the limiting factor. This year, we had favorable ice – thick ice that is safe. It stayed, it was safe, and we also had the right wind. North or Northeast is the right wind for Point Hope whaling.

We need that – it opens up the lead. This year was good. Thick ice with the right wind. (SRB&A Key Informant Interview Point Hope June 2017)

In contrast, most previous years in Point Hope have seen unmet quotas or higher struck and lost ratios. Whaling captains again observed that ice conditions were a major factor:

Last year, we had an "add-on" of thin ice upon which we could not pull up a whale; it was too thin to support the weight. We could have caught six whales, but we did not want to waste them because we knew the ice was too thin to pull them up. (SRB&A Key Informant Interview Point Hope June 2017)

Whaling captains in Savoonga, Gambell, and Wainwright also noted the impact that ice and weather conditions have on their whaling success. When ice is pushed up against the shore and it is unstable, they are unable to access the open water to hunt whales; furthermore, too much or the wrong type of wind (i.e., wind direction) can cause unsafe boating conditions:

If we don't get [bowheads], we can't send [share] them. I think it's twofold. One is climate change, changing environmental conditions so rapidly that we had [to adapt]. I see these guys looking for bowheads [now]. That's what it's going to take [adaptation]. We can see them, but we just can't get to them. [There is] too much ice, and not the right weather conditions. (Savoonga Whaling Captains Association Meeting March 2017)

You can see by the graph – the lower [harvest] number years, the weather played a factor. Either the ice was closed up or it was windy, and we couldn't be out there…. Sometimes we have a double lead—one close to us and one farther away—so it all depends on how they travel. (Wainwright Whaling Captains Association Meeting March 2017)

One thing I haven't heard in all this discussion since then is the weather factor, and the current is—the current has changed quite a bit, it seems like. Starting now to late spring, the current is always going due north. Usually it shifts in early fall. The north/south current is stronger—to now, to late spring, the current is going to be always flowing north. That's one big factor. I mean I just haven't heard it mentioned. With the thin ice, once we hit warmer water the ice is going to vaporize, - "Poof!" Magic. "Poof!" It doesn't keep going north. It just vanishes. (Gambell Whaling Captains Association Meeting March 2017)

Another factor that has increasingly become an issue for whaling crew success is disturbance from vessel, air, and ground traffic. Residents noted that the noise from these activities affects bowhead whale distribution, driving them farther offshore and away from whaling crews:

Respondent 1: One too many ships out there.
Respondent 2: Last year we were trying to chase whales and there were ships all over out there.
Respondent 1: Only difference is last year, that was asked for—Quintillion [fiber optic work]. But before that, when Shell was out there, I think there was a level of stress and worry [among whalers]. They [ships] push them [whales] out. The noise pushes them out. You can hear the ships from far [away]. (Wainwright Whaling Captains Association Meeting March 2017)

Conflict Avoidance Agreements with oil and gas industry help reduce or eliminate some of these impacts but generally do not include non-industry activity (e.g., commercial barges). Climate change and industry activity will have an ongoing effect on whaling success and efficiency.

Reevaluation of Factors Affecting Need

One purpose of this study was to reevaluate current need for bowhead whales by taking into account the current and longstanding practice of sharing of bowhead whales outside Alaska Eskimo whaling communities. This section does not provide a quantitative reassessment of need for bowhead whales, but instead reevaluates factors that were not taken into account in the original needs assessment. This study and the original quantification statement focus on the cultural and subsistence need for bowhead whales. As stated in Braund et al. (1988), "…the need addressed here refers to the traditional need by Alaska Eskimos to maintain a healthy and viable culture." This includes the various activities associated with harvesting a bowhead whale: preparing for the hunt, hunting and harvesting a whale, butchering and processing, distributing and sharing the whale throughout the village and beyond, participating in feasts and festivals, and consuming traditional foods and meals associated with the bowhead whale harvest. As detailed above (*The Role of Bowhead Whale and Sharing in Alaska Eskimo Society*), sharing is a core Alaska Eskimo value, and the bowhead whale harvest exemplifies the importance of this value more than any other resource. The original quantification addressed need by determining the number of bowhead whales that would be required to continue a harvest rate based on a period that ended nearly 50 years ago and was characterized by low numbers of both bowheads and Alaska Eskimos.

Thus, the original quantification method was a method designed to maintain subsistence and cultural need relying on outdated trends and information. To address cultural and subsistence need today, a quota should provide ample opportunities for Alaska Eskimos to participate in hunting, harvesting, butchering, processing, distributing, sharing, celebrating, and consuming of the bowhead whale in the context of their contemporary society. Ample participation in these activities not only maintain, but also strengthen cultural identity and allow it to flourish. Because not all Alaska Eskimos live in their home communities, their opportunities to participate in the above activities are often limited. Consuming bowhead whale meat and *maktak* they have received from their home communities, and distributing those foods to others, is one key way in which they maintain their cultural identity. The duty of a whaling captain is to provide for his community at large – a community which includes not just the people in his village, but the other villages within his region who do not have whale; family and friends who live outside of the region and continue to rely on bowhead meat and *maktak* and what it means to their cultural identity. An adequate quota would allow a whaling captain to fulfill those duties.

The method developed in the 1980s to quantify the cultural and subsistence need for whale (Braund et al. 1988) used the available historic data to show the number of whales landed by year alongside the human population for the community during the same years. For each community, the study team calculated the mean number of bowhead whales landed per capita for the period 1910 to 1969 by dividing the total number of known whales landed by the total population (for years where landed whale data were available, even if the number was zero). The mean number of bowhead whales was then multiplied by the most current known population for each community to calculate the current need. Table 17 shows the most recent needs assessment using the original method of quantification and based on the most recent census year (2010) (SRB&A 2012). It is important to note that the data for the 1910 to 1960 period was limited to *known* harvests; it does not include harvests that were not recorded. Hence, it is an incomplete and minimal data set.

Table 17: Eleven Alaska Eskimo Whaling Villages' Subsistence and Cultural need for Landed Bowhead Whales, 2010[1]

Community	Number of Observations[2]	Total Eskimo Population for ea. yr. of a Bowhead Observation[3]	Number of Bowheads Landed, 1910-1969[4]	Mean Landed Per Capita 1910-1969[5]	2010 Alaska Native Population[6]	2010 Bowhead Need (Landed)[7]	2010 Need (Landed) (Rounded)[8]
Gambell	39	11,883	68	0.005722	654	3.7	4
Savoonga[9]	0	----	----	0.005722	637	3.6	4
Wales	42	6,907	5	0.000724	136	0.1	1
Diomede[10]	30	3,250	11	0.003678	110	0.4	1
Kivalina	7	926	3	0.003240	366	1.2	1
Point Hope	50	12,467	209	0.016764	629	10.5	11
Point Lay	34	2,080	8	0.003846	168	0.6	1
Wainwright	49	10,723	108	0.010072	510	5.1	5
Utqiaġvik	60	44,687	379	0.008481	2,889	24.5	25
Nuiqsut[9]	0	----	----	0.008481	360	3.1	3
Kaktovik	3	327	3	0.009174	215	2.0	2
Totals	314	93,250	794		6,674	54.9	58
Region[11]	314	93,250	794	0.008515	6,674	56.8	57

Source: SRB&A 2012

[1] Subsistence and cultural need is based on historic per capita harvest per community multiplied by the 2010 Alaska Native population of each community.

[2] The number of observations represents the number of years for which data on landed whales were available for each community (See Appendices 1 & 2 of Braund, Stoker & Kruse 1988, Table 1 of Stephen R. Braund & Assoc. 1991, and Table 17 of Stephen R. Braund & Assoc. 2008).

[3] Total Eskimo population represents the sum of the Eskimo population for each year there was an observation of a landed bowhead whale (only includes the 1910-1969 "Base Period;" see Braund, Stoker & Kruse 1988).

[4] Number of bowheads landed represents the sum of the observed bowheads landed between 1910 and 1969.

[5] The mean landed bowhead whales per capita is based on the total number of whales landed between 1910 and 1969 for each community divided by the sum of the total Eskimo population for each village for each year landed whale data existed between 1910 and 1969 (See Appendices 1 & 2 in Braund, Stoker & Kruse 1988, Tables 1 and 3 in Stephen R. Braund & Assoc. 1991, and Tables 2 and 17 in Stephen R. Braund & Assoc 2008). The sum of the total Eskimo population was calculated by adding the population estimates for each community for each year that there was a landed whale observation. For example, Utqiaġvik's 379 landed whales from 1910-1969 was divided by the total Eskimo population sum of 44,687 for this 60 year period (i.e., 379 divided by 44,687 = .008481).

[6] 2010 Alaska Native population data for each community are from the 2000 U. S. Census. They represent the category "American Indian or Alaska Native alone or in combination with one or more other races."

[7] The number of bowheads needed is derived by multiplying the mean per capita landed whales (1910-1969) by the 2010 Alaska Native population for each community. The true column total of 54.9 is shown and is less than the sum of its parts because of their being rounded up.

[8] The number of bowhead whales needed per individual community is rounded to the nearest whole number unless the product was less than .5; such cases were rounded up to one.

[9] Because there are no landed bowhead data for either Savoonga or Nuiqsut between 1910-1969, the mean per capita landed whales for Gambell was used for Savoonga and the mean for Utqiaġvik was used for Nuiqsut.

[10] Due to uncertainties in the landed whale data for Little Diomede Island, four different calculations of subsistence and cultural need, ranging from .4 to 1.0 bowheads, were presented (see Table 4 Stephen R. Braund & Assoc. 1991). The Little Diomede mean landed whale per capita (1910-1969) in this table represents the mean of these four calculations.

[11] The mean per capita landed whales for the region represents the total number of whales landed for all 11 communities between 1910 and 1969 divided by the sum of the total Native population for all communities for each year landed whale data existed between 1910 and 1969 (i.e., 794 whales divided by 93,250 = .008515).

At its 64th annual meeting, the IWC adopted catch limits for Alaskan and Chukotka whalers for the 2013 to 2018 time period (AEWC 2017). The quota was set at 336 whales landed over the six-year period. The quota includes an annual limit of 67 strikes in a single year, with the potential for 15 unused strikes to be transferred from previous years. Table 18 shows how the AEWC allocated the IWC block quota, in addition to the most recent assessment of need, by community.

Table 18: Current AEWC Quota and Assessed Need, by Community

Community	AEWC Allocated Strike Quota, 2013-2018	2010 Landed Whale Needs Assessment
Gambell	8	4
Savoonga	8	4
Wales	2	1
Little Diomede	2	1
Kivalina	4	1
Point Hope	10	11
Point Lay	2	1
Wainwright	7	5
Utqiaġvik	25	25
Nuiqsut	4	3
Kaktovik	3	2
Total	75	58
Sources: AEWC 2017; SRB&A 2012		

When asked about the adequacy of the quota for sharing outside their community, many whaling captains noted that harvests are not always adequate to share outside their communities at desired levels. When discussing future need, whaling captains and crew members stressed the importance of considering demographic changes, particularly related to an increase in outmigration from the whaling communities. As noted elsewhere in this report, while the current method for assessing need takes into account demographic changes within each community (e.g., community population changes), it does not take into account the increasing population of individuals who have moved out of AEWC communities but who maintain social, cultural, and kinship ties with their home communities (see "Existing Data on Sharing Outside Alaska Eskimo Whaling Communities" and "Alaska Eskimo Population and Distribution Trends"). When whaling crews harvest a whale, they are not only harvesting that whale for the residents of their community, but for family, those with whom they maintain kinship ties who live elsewhere, and for the residents of non-whaling communities with whom they practice subsistence exchange. As that population grows, so will the need for bowhead whale:

> *I think [a quota of] eight is adequate for now. But the outmigration of our relatives, more and more are staying in Anchorage, Nome, Kotzebue. There are students that are out for schooling right now. Some of them are in Lower-48, and they want bowhead too.* (Savoonga Whaling Captains Association Meeting March 2017)

While the sharing of bowhead whale outside the whaling communities did occur in the early 1980s at the time of the development of original quantification method (Table 11), the proportion of Alaska Natives living outside their home whaling communities has increased significantly since that time. It was stressed over and over to the study team that most Alaska Eskimos maintain their cultural ties to their home communities, regardless of where they live, often return to participate in subsistence activities, including whaling, or find other means of participating in the subsistence sharing economy. In addition, as noted above, recent social science research is beginning to reveal in greater detail the extensive sharing patterns that underlie Alaska's rural subsistence economy. Despite the increasing evidence of sharing outside of whaling communities (see section entitled *Existing Data on Sharing Outside Alaska Eskimo Whaling Communities*)—including the documentation by the ADF&G of the percentage of households in 61 non-whaling communities who use bowhead whale—quantitative data (e.g., pounds of bowhead received by non-whaling communities) are lacking. Because of the lack of quantitative data, it is not possible at this time to reassess bowhead whale need (e.g., specific per capita need) by taking into account sharing to non-whaling communities. Further research, including more systematic documentation of the amount of bowhead whale shared outside whaling communities in addition to the extent of sharing to Alaska Eskimos living in urban areas, would be necessary for such a reassessment.

During the course of this research, the study team identified a number of potential issues with the original needs assessment which merit consideration, in addition to various demographic and other changes to Alaska Eskimo whaling communities. As noted above, when asked how many landed bowhead whales were adequate for their community, most whaling captains responded that their current quota was adequate, when met. However, a number of individuals pointed out that the current allocation system, providing 75 strikes, represents the community's need for landed whales; in other words, the AEWC annual allocated number of strikes (75) represents, to whaling captains, the communities' current need for landed whales. This suggests that the 2010 assessed need of 58 landed whales is not adequate. As discussed earlier, the study team identified a number of issues with the current needs assessment methodology—particularly the reliance on a 1910-1969 base period to calculate current need—which may have resulted in an underestimate of need for the study communities for the following reasons:

1. Need was based on a period when harvests were limited due to a low population of Alaska Eskimos and bowhead whales;

2. Need was based on "known" harvests, an incomplete data set because it did not include historic harvests that may have occurred, but for which there was no retrievable record. Also, for a number of communities (Savoonga, Kivalina, Point Lay, Nuiqsut, and Kaktovik), need was based on a limited number of data years, or no data years were available;

3. Need was based on a method that did not consider the sharing of bowhead whale to Alaska Eskimos living outside their home communities or Alaska Natives in non-whaling communities.

The first and second issues affect the primary driver of the assessment – the calculation of per capita need. Regarding the third issue—failure to take into account the considerable sharing outside Alaska Eskimo whaling communities—further research into the extensive sharing economy, which extends throughout the state and includes Alaska Eskimo whaling communities, could refine the assessment of need by revealing the amount and frequency of bowhead whale sharing to non-whaling communities. In addition, as noted in the section above (Resource Trends/Availability), changes in the availability of other resources (e.g., declining walrus and/or caribou harvests) may affect need for bowhead whales in the future. A number of individuals discussed the view that while bowhead whale abundance seems to be increasing, the future availability of other resources, such as caribou and walrus, is more precarious due to increased regulation and, in the case of walrus, decreased access resulting from changes in sea ice. Hence, the need for bowhead whales may increase in the absence of those resources. In addition, there are other factors that have increased, and may continue to increase, the frequency and quantity of sharing of bowhead whale since the original assessment of need in the 1980s. These include increased ease and reliability of transportation in rural Alaska; the availability of air freight; and improved inter-village communications with telephone and internet access. If sharing levels continue to increase, this may also increase the need for bowhead in the future. In conclusion, given the extent of bowhead sharing to other rural communities, a customary practice which is not accounted for in the current needs assessment, the present quota does not adequately represent contemporary need, and additional research is needed in this area.

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8.2 National Oceanic and Atmospheric Administration-Alaska Eskimo Whaling Commission Cooperative Agreement (as amended in 2017)

COOPERATIVE AGREEMENT
between the
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
and the
ALASKA ESKIMO WHALING COMMISSION
as amended
2013

1. <u>PURPOSES</u>

The purposes of this agreement are to protect the bowhead whale and the Eskimo culture, to promote scientific investigation of the bowhead whale, and to effectuate the other purposes of the Marine Mammal Protection Act, the Whaling Convention Act, and the Endangered Species Act as these acts relate to aboriginal subsistence whaling.

In order to achieve these purposes, this agreement provides for:

(a) Cooperation between members of the Alaska Eskimo Whaling Commission (AEWC) and the National Oceanic and Atmospheric Administration (NOAA) in management of the bowhead whale hunt through 2018; and

(b) an exclusive enforcement mechanism that shall apply during the term of this agreement to any violation by whaling captains (or their crews) who are registered members of the AEWC of any provisions of the Marine Mammal Protection Act, the Endangered Species Act, or the Whaling Convention Act, as these acts may relate to aboriginal subsistence whaling; of the International Convention for the Regulation of Whaling, 1946; of regulations of the International Whaling Commission; of the AEWC Management Plan; or of this agreement.

2. <u>RESPONSIBILITIES</u>

NOAA has primary responsibility within the United States Government for management and enforcement of programs concerning bowhead whales. The AEWC is an association governing Alaskan Eskimo whalers who hunt for bowhead whales. The AEWC adopted a Management Plan on March 4, 1981, to govern hunting for bowhead whales by Alaskan Eskimos. The AEWC and NOAA have cooperatively managed the bowhead hunts since 1981. Under this Cooperative Agreement, the AEWC will, in continued cooperation with NOAA, manage the bowhead whale hunts through 2018. The authority and responsibilities of the AEWC are contained in and limited by this agreement and the Management Plan, as amended from time to time, to the extent the Management Plan is not inconsistent with this agreement. If the AEWC fails to carry out its enforcement responsibilities or meet the conditions of this agreement or of the Management Plan, as amended from time to time, NOAA may assert its federal management and enforcement authority and will regulate the bowhead whale hunt in a manner consistent with federal law, this agreement, and the Management Plan to the extent necessary to carry out the responsibilities that are not carried out by the AEWC. Such assertion of federal authority will be preceded by notice to the AEWC of intent to regulate the bowhead whale hunt to the extent necessary to carry out those responsibilities and conditions, and will not be effected until the AEWC or its members have been given an opportunity to present their views on the need for such assertion in a public forum: provided, however, that in cases where NOAA determines that irreparable harm to the bowhead whale resource might result, the assertion of federal authority may be effected immediately after notice, in which cases the public forum on the need for such assertion will be conducted as soon as practicable thereafter.

3. <u>INSPECTION AND REPORTING</u>

NOAA personnel shall monitor the hunt and the AEWC shall assist such personnel with such monitoring. The AEWC shall report to NOAA regarding the number of strikes and landings. The AEWC shall also inform all whaling captains who are engaged in whaling activities of the number of whales struck or landed at all times. On the first of each month during the spring and fall whaling seasons, the AEWC shall inform NOAA of the number of bowhead whales struck during the previous month. The AEWC shall also provide a report to NOAA within 30 days after the conclusion of the spring hunt, and within 30 days after the fall hunt but no later than March 31, containing at least the following information:

(1) The date and exact, to the extent practicable, location of strike for each whale struck or landed, including, at a minimum, the estimated distance and bearing from the village or whaling camp;

(2) The length (as measured from the point of the upper jaw to the notch between the tail flukes) and the sex of the whales landed;

(3) The length and sex of a fetus, if present, in a landed whale; and

(4) An explanation of circumstances associated with the striking of any whale not landed, and an estimate of whether a harpoon or bomb emplacement caused a wound which might be fatal to the animal (e.g., the harpoon entered a major organ of the body cavity and the bomb exploded).

NOAA shall provide technical assistance in collection of the above information. The AEWC shall assist appropriate persons in collection of specimens from landed whales. The AEWC shall encourage whaling captains to make such specimens available to researchers upon written request to the AEWC. NOAA personnel cooperating with the AEWC shall work closely with the AEWC Commissioner in each whaling village to facilitate the accurate monitoring of the hunt.

4. MANAGEMENT

(1) No more than seventy-five (75) bowhead whales shall be struck in 2013. The AEWC and NOAA shall determine the total number of bowhead whales that may be struck in each year from 2014 through 2018, and any applicable number of bowhead whales that may be landed, through annual negotiations during the first quarter of the year for which the quota is applicable: provided, however, that the Under Secretary or his designee may, in consultation with the AEWC, reconsider and revise the term of this paragraph if he deems it necessary on the basis of public comments received pursuant to the Federal Register notice of the allocations.

(2) Registered whaling captains shall hunt under the provisions of the AEWC Management Plan, and will use all practical means to improve hunting efficiency.

(3) The AEWC shall determine the allocation of these permitted strikes among the whaling villages.

(4) The AEWC Management Plan will provide that the meat and edible products of bowhead whales taken in the subsistence hunt must be used exclusively for native consumption and may not be sold or offered for sale.

5. ENFORCEMENT

(1) The AEWC agrees that registered whaling captains may be subject to civil monetary assessments for whales struck over the annual strike limit as set forth in this Agreement and whales landed over any landing limit that is prescribed in this

agreement and the Management Plan as they may be amended from time to time. The AEWC will collect the assessments from the whaling captains. In the event of a dispute between NOAA and the AEWC over the number of whales landed or struck or the amount of the assessment, or other factual matters, NOAA will consult with the AEWC about the matter. If the dispute cannot be resolved, it will be referred to an administrative law judge for determination under a trial-type administrative proceeding of the facts and the amount of assessment. The procedures contained in 15 CFR sections 904.200-904.273 will control these proceedings. The decision of the administrative law judge may be appealed to the Administrator of NOAA. Whaling captains may also be liable for civil assessments for other violations of the Management Plan as determined by the AEWC or by an administrative law judge under the procedures described above.

(2) In consideration of the AEWC's agreement hereunder, the Government of the United States agrees that the enforcement procedure described in paragraph (1) of this section shall be the exclusive enforcement mechanism that shall apply during the term of this agreement to any violation by whaling captains or their crew who are registered members of the AEWC of any provisions of the Marine Mammal Protection Act, the Endangered Species Act, or the Whaling Convention Act, as these Acts may relate to aboriginal subsistence whaling; of the International Convention for the Regulation of Whaling, 1946; of any regulations of the International Whaling Commission; of the Management Plan; or of this agreement.

(3) The AEWC shall maintain a list containing the names of all registered whaling

captains and shall make this list available to NOAA upon request.

6. AUTHORITIES

This Cooperative Agreement is concluded under the authorities governing management of living marine resources, including but not limited to the Marine Mammal Protection Act of 1972 and the Whaling Convention Act of 1949.

7. DURATION

This Agreement will become effective upon the signature of the approving officials of both the AEWC and NOAA, and will remain in effect through March 31, 2019.

8. CONSULTATION

NOAA and the AEWC shall consult during the operation of this Agreement concerning the matters addressed herein as well as all other matters related to bowhead whales which either party believes are suitable for such consultation. Specifically, NOAA shall consult with the AEWC on any action undertaken or any action proposed to be undertaken by any agency or department of the Federal Government that may affect the bowhead whale and/or subsistence whaling and shall use its best efforts to have such agency or department participate in such consultation with the AEWC.

9. LIMITATION OF USE

Nothing in the Agreement shall be construed to support or contradict the position of either party regarding the jurisdiction of the International Convention for the Regulation of

Whaling, 1946, or the Whaling Convention Act of 1949 with respect to aboriginal subsistence whaling by Alaskan Eskimos.

10. AMENDMENT

This Agreement may be amended from time to time by mutual written consent of the parties. Such amendments may be approved, on behalf of NOAA, by the United States Deputy Commissioner to the International Whaling Commission, or his designee.

Dated: 2·6·2013

Dated: 2-20-13

George Noongwook
Chairman, Alaska Eskimo
Whaling Commission

Samuel D. Rauch III
Deputy Assistant Administrator Regulatory Programs, performing the functions and duties of the Assistant Administrator for Fisheries

2018 AMENDMENT
to the
COOPERATIVE AGREEMENT
between the
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
and the
ALASKA ESKIMO WHALING COMMISSION

The Alaska Eskimo Whaling Commission (AEWC) and the National Oceanic and Atmospheric Administration (NOAA) hereby agree to amend their Cooperative Agreement as follows:

Article 4, Paragraph (1) is amended to read as follows:

"No more than 75 bowhead whales shall be struck in 2018."

John Hopson, Jr.
Chairman, Alaska Eskimo Whaling Commission

Date: 12/13/17

Ryan Wulff
Acting U.S. Commissioner to the International Whaling Commission

Date: 12/14/17

8.3 Alaska Eskimo Whaling Commission Management Plan

ALASKA ESKIMO WHALING COMMISSION
MANAGEMENT PLAN

AS AMENDED ON:

FEBRUARY 15, 2991

FEBRUARY 14, 1992

FEBRUARY 15, 1995

FEBRUARY 14, 2003

FEBRUARY 4, 2005

FEBRUARY 5, 2016

SUBPART A

<u>INTRODUCTION</u>

SUBSECTION 100.1 <u>PURPOSE OF REGULATIONS</u>

It is the purpose of the regulations contained herein to:

(a) Insure safe and efficient subsistence harvest of bowhead whales;

(b) Provide a means within the Alaska Eskimo customs and institutions of protecting the habitat of the bowhead whale and limiting the bowhead whale harvest in order to prevent the extinction of such species; and

(c) Provide for Eskimo regulation of all whaling activities by Eskimos who are members of the Alaska Eskimo Whaling Commission.

SUBSECTION 100.2 <u>SCOPE OF REGULATIONS</u>

The regulations contained herein apply to the subsistence hunting of whales by Eskimos who are members of the Alaska Eskimo Whaling Commission.

SUBPART B

<u>ALASKA ESKIMO WHALING COMMISSION</u>

SUBSECTION 100.11 <u>POWERS</u>

(a) The Alaska Eskimo Whaling Commission (hereafter AEWC) is empowered to administer the regulations contained herein to insure that the purposes in Subsection 100.1 of these regulations are attained.

(b) The AEWC is empowered to enforce the regulations by:

(1) denying any whaling captain or crew member who violates these regulations the right to participate in hunting bowhead whales

(2) making civil assessments

(3) acting as an enforcement agent for any government entity authorized to enforce thee regulations.

(c) The AEWC is empowered to promulgate interim regulations that are in addition to, but not inconsistent with regulations contained herein.

SUBSECTION 100.12 DUTIES

(a) The AEWC shall administer and enforce the regulations contained herein (including any interim regulations).

(b) The AEWC shall conduct village education programs to facilitate compliance with these regulations, including training programs for whaling captains and crew.

(c) The AEWC shall initiate research for improvement of the accuracy and reliability of weapons.

SUBPART C

REGULATIONS

SUBSECTION 100.21 DEFINITIONS

(a) "bowhead whale" means a whale whose scientific name is baleana mysticetus and which mitigates past whaling villages in Alaska.

(b) "captain" means the person in charge of a registered whaling crew.

(c) "harvest" means to kill and bring to shore or butchering area.

(d) "non-traditional weapons" means any instrument that could be used to harvest a bowhead whale that is not a traditional weapon.

(e) "traditional weapon" means a harpoon with line attached, darting gun, should gun, lance or any other weapon approved by the AEWC as such a weapon in order to improve the efficiency of the bowhead whale harvest.

(1) "harpoon with line attached" means a harpoon with a rotating head which is attached to a line and float and which has no explosive charge. (See figure 7 and 8 of Appendix E of the FEIS on the International Whaling Commission's Deletion of Native Exemptions for the Subsistence Harvest of Bowhead Whales. (October 1977) (hereinafter FEIS).

(2) "darting gun harpoon" means a harpoon with an explosive charge and with a line and float attached. (See Appendix E of FEIS of Figure 4).

(3) "shoulder gun" means a whaling gun, adapted from the era of commercial whaling in the 19th century, which shoots an explosive charge.

(4) "lance" means a non-explosive sharply pointed weapon without a harpoon head.

(5) "explosive charge" as used in subparagraph (2) of this paragraph includes, in addition to a black powder projectile, a penthrite-based explosive charge developed, approved, and issued to a whaling captain by the AEWC, unless such explosive charge has not been issued or is not compatible with the darting gun harpoon.

(f) "whaling crew" means those registered persons who participate directly in the harvest of attempted harvest of the bowhead whale and are under the supervision of a registered captain.

(g) "whaling village" means the Alaska Eskimo Whaling village in which resides a whaling captain and crew which participates in the harvest of bowhead whales and which is represented by a Commissioner of the AEWC.

(h) "whaling season" means customary period of time during which the bowhead whale is harvested, either in the Spring or Fall.

(i) "garbage" means anything that the whaling captains and crew brings out to the ice that is not biodegradable.

(j) "habitat" means the water and associated land and ice environment used by the bowhead whale.

SUBSECTION 100.22 REGISTRATION

(a) Every year, prior to participating in the bowhead subsistence hunt, each captain shall register himself, each of his crew members, and each of his boats with the AEWC on forms provided by the AEWC for that purpose, which discloses his name, address and qualifications as a captain and his willingness to abide by the regulations of the AEWC and to require his crew to abide by those regulations. If a captain registers for the spring hunt but then wishes to use a different boat or additional boats of different or additional crew members during the fall hunt, those boats and crew members must be registered before the fall hunt.

(b) The AEWC shall take into account any reading or language difficulties in developing procedures and forms for registration.

SUBSECTION 100.23 REPORTS

(a) Each whaling captain shall be responsible for keeping a written record of the number of whales:

(1) attempted to be harvested by using traditional weapons but not harvested.

(2) Harvested by the captain or his crew, and

(3) Sighted by the captain and his crew.

(b) Each whaling captain shall report the date, place, and time of any striking not resulting in harvesting and shall describe:

(1) the size and type of bowhead whale,

(2) any known latter attempted harvest or actual harvest of said whale,

(3) the reason for the captain or crew not harvesting the whale, i.e., environmental factors, the failure of traditional weapons; or other reasons, and

(4) the conditions of the whale that was not harvested.

(c) Each whaling captain shall make other reports as the AEWC requires in order to accomplish the purposes of the regulations herein or in order to advance the scientific knowledge of the bowhead whale.

SUBSECTION 100.24 PERMISSIBLE HARVESTING METHODS

(a) No whaling captain or crew shall harvest or attempt to harvest the bowhead whale in any manner other than the traditional harvesting manner

(b) "traditional harvesting manner" means:

(1) only traditional weapons shall be used as defined in Subsection 100.21(e).

(2) the bowhead whale shall first be struck with a harpoon or darting gun with line and float attached.

(3) the shoulder gun may be used:

(I) after a line has been secured to the bowhead whale, or

(II) when pursuing a wounded bowhead whale with a float attaché to it.

(4) the lance may be used after a line has been secured to the bowhead whale.

(5) no whaling captain or crew shall attempt to harvest a calf or a cow accompanied by a calf.

(c) No whaling captain or crew shall attempt to harvest a calf or a cow accompanied by a calf.

(d) No whaling captain or crew shall engage in whaling in a wasteful manner, including the processing, storage, or use of the ordi.

SUBSECTION 100.25 TRADITIONAL PROPRIETARY CLAIM

The bowhead whale shall belong to the captain and crew which first strikes the bowhead whale in the manner described in Subsection 100.24.

SUBSECTION 100.26 LEVEL OF HARVEST

(a) The AEWC shall establish the levels of harvest or attempted harvest for each whaling village during each season or seasons.

(b) In establishing the levels of harvest or attempted harvest, the AEWC shall consult each whaling village.

SUBSECTION 100.27 REGULATIONS TO PROJECT THE BOWHEAD WHALE HABITAT

(a) All whaling crews shall bring their garbage back to land and dispose of it in a proper manner.

SUBSECTION 100.28 NATIVE CONSUMPTION

The meat and products, except for traditional native handcrafts, of whales taken in the subsistence hunt must be exclusively for native consumption and may not be sold or offered for sale.

SUBSECTION 100.29 PROCEDURES FOR ADDRESSING MANAGEMENT PLAN VIOLATIONS

(a) For any village having a local Whaling Captains' Association (WCA) Dispute Panel recognized by the AEWC, a hearing by the local WCA Dispute Panel shall be triggered if a whiling captain submits a written complaint to the President of the WCA identifying a Management Plan violation by a fellow whaling captain. If such a written complaint is received, the WCA Dispute Panel shall:

(1) determine whether a violation of the AEWC Management Plan did occur and if so, what the circumstances of that violation were;

(2) if it is found that a violation of the AEWC Management Plan did occur, determine a recommended penalty consistent with the Subsection _____ below.

(3) forward to the AEWC Board of Commissioners:

i. a written description of the violation and the findings made by the Dispute Panel; and

ii. the Dispute Panel's recommendations regarding the imposition of a penalty.

(b) For any village not having a local WCA Dispute Panel recognized by the AEWC, or that otherwise wishes to seek the assistance of the AEWC in addressing a possible violation, the President and/or Commissioner of the local WCA regarding a possible violation of the Management Plan shall be submitted to the AEWC Board of Commissioners through the AEWC Office.

SUBSECTION 100.30 AEWC BOARD OF COMMISSIONERS REVIEW AND HEARING PROCEDURES

(a) Upon receipt of a notice of determination made under Subsection 100.29(a), the AEWC Board of Commissioners shall review all documentation related to the incident of violation and the recommended penalty. If for any reason, the Commissioners disagree with the determination of the local WCA or the proposed penalty, the matter shall be returned to the local WCA with recommendations for further action.

(b) In all cases, the AEWC Board of Commissioners retains the authority to impose a penalty for violation beyond the recommendations of a local WCA.

(c) Upon receipt of a notice of possible violation made under Subsection 100.29(b), the AEWC staff shall gather the following information:

(1) the names of the captain and all crew members involved in the incident, and the names of all the other crews and community members who witnessed the incident;

(2) the captain's completed harvest report.

(3) If eyewitness testimony is to be provided to the Board of Commissioners by witnesses who will be unable to testify at the Board of Commissioners' hearing, staff shall gather sworn affidavits prepared by those individuals.

(4) If the possible violation involved a whale thought to be a calf, the captain and crew shall provide the AEWC staff with one full piece of baleen from the tip to the upper jawbone taken from the middle of the rack. The baleen shall be sent with a sworn statement from the Officers of the local WCA attesting that it is from the whale in question that is thought to be a calf.

(d) For incidents occurring during the spring harvest, the review of the local WCA determination or the hearing, when necessary, shall be held during the same year at the Second Quarterly meeting of the AEWC Board of Commissioners. For incidents occurring during the fall harvest, a review of determination or hearing shall be held at the following year's First Quarterly meeting of the AEWC Board of Commissioners.

(e) The Board of Commissioners may schedule an emergency hearing if deemed necessary based on the nature of any reported violation.

(f) Testimonial evidence considered during a hearing shall be provided by the captain in-person; testimony of crew members and other witnesses shall be by teleconference or sworn affidavit.

(g) Upon final determination of a violation and imposition of penalty, the AEWC shall issue a certified letter to the whaling captain, with copies to the local WCA President and Commissioner, identifying the penalty and outlining the imposition of penalties.

SUBSECTION 100.31 IMPOSITION OF PENALTIES

(a) Whaling captains and crew members whom the AEWC Board of Commissioners determines have violated the regulations contained in Subsections 100.24(a)-(d) and/or 100.26, after opportunity for a hearing as set forth in Subsection 100.29, shall be subject to the following penalties:

(1) Denial of participation in the harvest for a period of not less than one year and not more than five years, and a fine of not less than $2500 and not more than $10,000;

(2) For repeat offenses, any offense found to have been intentional, or any offense involving negligent disregard for these management regulations or the management authority of the AEWC, denial of participation in the harvest of not less than [5 years] and a fine of not less than [$10,000];

(3) For a any offense otherwise involving gross disregard for these management regulations or the management authority of the AEWC, a lifetime ban on registration as an AEWC whaling captain.

(4) The take of a fall calf found by the AEWC Board of Commissioners to be unintentional shall not be subject to penalty.

SUBSECTION 100.32 APPEAL OF AEWC DECISIONS

(a) Any captain subject to the imposition of penalties under this Management Plan may appeal the finding to the AEWC Board of Commissioners.

(b) A notice of request for appeal shall be submitted to the AEWC office in writing and shall set forth an explanation of the bases of the appeal.

(c) A decision of the AEWC Board of Commissioners on an appeal shall be final and not subject to further appeal.

It is the responsibility of the whaling captains/crew to report to the Commissioner of their village on a daily basis when they are whaling. The Commissioners then reports to the AEWC Central Office in Barrow. The AEWC office takes a report, which they pass on to the National Marine Fisheries Service (NMFS) office in Anchorage. Following completion of the season, the AEWC office then submits a final report to the U.S. Department of Commerce in Washington, D.C.

ALASKA ESKIMO WHALING COMMISSION
BOWHEAD WHALE HUNT
MANAGEMENT REPORTING PROCEDURES

VILLAGE WHALING CAPTAINS
REPORT TO THE

VILLAGE AEWC COMMISSIONER
WHO REPORTS TO THE

AEWC OFFICE IN BARROW
WHO REPORTS TO THE

NATIONAL MARINE FISHERIES SERVICE
(Anchorage, Alaska)
WHO REPORTS TO THE

UNITED STATES DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
(Washington, D.C.)

8.4 Endangered Species Consultation Letters

8.4.1 U.S. Fish & Wildlife

United States Department of the Interior
U.S. FISH AND WILDLIFE SERVICE
Fairbanks Fish and Wildlife Field Office
101 12th Avenue, Room 110
Fairbanks, Alaska 99701
May 14, 2018

Carolyn Doherty
Foreign Affairs Specialist
NOAA Fisheries
U.S. Department of Commerce

Re: Section 7 Endangered Species Act determination for Draft EIS for issuing annual catch limits to the Alaska Eskimo Whaling Commission for a subsistence hunt on bowhead whales for the years 2019 – 2025.

Dear Ms. Doherty:

Thank you for inquiring about endangered and threatened species and critical habitats pursuant to section 7 of the Endangered Species Act of 1973 (ESA), as amended.

THE PROPOSED ACTION

The National Oceanic and Atmospheric Administration's (NOAA) National Marine Fisheries Service (NMFS) proposes to issue annual catch limits to the Alaska Eskimo Whaling Commission (AEWC) to allow continuation of subsistence harvest of bowhead whales from the Western Arctic stock from 2019 – 2025, under the Whaling Convention Act (WCA) and the Cooperative Agreement with the Alaska Eskimo Whaling Commission (AEWC), and subject to International Whaling Commission (IWC)-set catch limits. Eleven Alaskan Native coastal villages along this migratory route participate in traditional subsistence hunts of these whales: Gambell, Savoonga, Little Diomede, and Wales (on the Bering Sea coast); Kivalina, Point Hope, Point Lay, Wainwright, and Utqiaġvik (on the coast of the Chukchi Sea); and Nuiqsut and Kaktovik (on the coast of the Beaufort Sea).

The purpose of this action is twofold: (1) to manage the conservation and sustainable subsistence utilization of the Western Arctic stock of bowhead whales (as required under the International Convention for the Regulation of Whaling (ICRW), the Whaling Convention Act (WCA), the Marine Mammal Protection Act, and other applicable laws), and (2) to fulfill the Federal Government's trust responsibility to recognize the cultural and subsistence needs of Alaska Natives.

NMFS proposes to permit the AEWC an annual strike limit of 67 bowhead whales, not to exceed a total of 336 landed whales over any 6-year period, with unused strikes from

1

previous years carried forward and added to the annual strike quota of subsequent years (subject to limits), provided that no more than 50 percent of the annual strike limit is added for any one year. This alternative would maintain the status quo for any 6-year period with respect to management of the hunt for landed whales and employ the Commission’s agreed-upon 50 percent carryover principle.

THE ACTION AREA

The action area includes the communities of Gambell, Savoonga, Little Diomede, and Wales (on the Bering Sea coast); Kivalina, Point Hope, Point Lay, Wainwright, and Utqiaġvik (on the coast of the Chukchi Sea); and Nuiqsut and Kaktovik (on the coast of the Beaufort Sea), and the hunting areas the vessels utilize within the Beaufort, Bering and Chukchi seas (Figures 1 – 3).

EFFECTS OF THE ACTION

Effects to eiders

The bowhead whale hunt occurs as spectacled and Steller's eiders are migrating north and east in spring leads, and also during fall migration as birds migrate west and south along the coast. Subsistence whaling activities may disturb migrating or marine-feeding listed eiders, but any disturbance by boats or hunting camps will be temporary, as individual birds are unlikely to spend Jong periods of time in the area, and activities will cease once whales are harvested. We recognize that subsistence bird harvest can occur during the whale hunt, and listed and candidate species, which are closed to harvest under the Migratory Bird Treaty Act, are sometimes inadvertently or intentionally taken during these hunts. However, we have no evidence that whaling activities would increase the total amount of take of listed species above that which would occur in the absence of whaling. Additionally, take of listed avian species is considered in a separate Biological Opinion on the Migratory Bird Subsistence Harvest Regulations annually promulgated by the U.S. Fish and Wildlife Service (Service).

In summary, we expect that subsistence whaling activities under the proposed quota would have, at most, an insignificant *additional* effect on listed and candidate avian species.

Spectacled eider designated critical habitat

Whaling may occur in portions of spectacled eider wintering critical habitat south of St. Lawrence Island. We do not expect whaling activities to cause physical changes to the primary constituent elements (PCEs), namely the biota of the water column and benthic substrate. While most of the spectacled eiders will have left the wintering area by the time whaling commences, whaling activities may affect the ability of any remaining spectacled eiders to access PCEs in portions of the critical habitat because the presence of vessels may temporarily deter eiders from using localized areas; however, this effect would be minor and temporary. Therefore, we expect that the activities would have, at most, an insignificant effect on designated critical habitat.

Polar bear
On May 15, 2008, the polar bear was listed as threatened (73 FR 28212). The proposed activities could temporarily disrupt the normal behavior of polar bears encountering such activities. It is possible that polar bears would be encountered by hunting crews in boats or on land or sea ice camps during whaling activities, particularly in the spring, as polar bears use open water leads for foraging. Polar bears are occasionally harvested in conjunction with whaling activities; however, separate subsistence polar bear hunts are conducted in several Native communities, and we have no evidence to suggest that polar bear harvest increases as a result of the whale hunt.

Polar bears disturbed on land or sea ice by boats or hunters on foot may run and/or enter the water and start swimming; this temporary change in behavior may cause a limited amount of stress. Evidence that bears can be re-sighted during repeated surveys in one fall season indicates that most of these disturbances are likely to be temporary (e.g., likely lasting a few moments up to five minutes; T. Evans 2011, MMM, pers. comm.); thus, we expect that polar bears would resume previous behaviors once the source of disturbance leaves the area. Polar bears first encountered while swimming will likely continue to swim with minimal effects from passing boats. Due to the temporary nature of the disturbance, we expect that whale hunting activities would have, at most, an insignificant effect on polar bears.

Polar bear critical habitat
The Service designated critical habitat for polar bears on November 24, 2010 (75 FR 76086). Proposed activities may occur within the no-disturbance zone of barrier island habitat (Unit 3) and on the sea ice (Unit 1). Subsistence whaling activities are unlikely to affect the Primary Constituent Elements (PCEs) and associated features that make designated critical habitat valuable to polar bears, but the activities may affect polar bear critical habitat either by causing disturbance or disrupting movements of polar bears, thereby interfering with the capacity of the critical habitat areas to provide their intended function. Noise and human activity resulting from subsistence whale harvest and associated camping may temporarily deflect polar bears from natural paths of travel. Areas with these disturbances may be temporarily unavailable to polar bears, but these impacts would be short term over a small spatial scale. The whale hunt does not occur during the denning season; therefore disturbance would not affect the ability of bears to use critical habitat for denning. Thus, disturbance from the proposed action is expected to have a minor effect, if any, on the capability of bears to use critical habitat and disturbance effects on the value of critical habitat are expected to be minimal. We believe that the proposed action would have, at most, an insignificant effect on critical habitat.

Short-tailed albatross
The short-tailed albatross is listed under the Endangered Species Act as Endangered throughout its range (65 FR 46643) on July 31, 2000. Short-tailed albatrosses forage widely across the temperate and subarctic North Pacific, and can occur in the Bering Sea in June. When feeding, albatrosses alight on the ocean surface and seize their prey, including squid, fish, and shrimp. If, in the unlikely event a foraging short-tailed albatross were to encounter whaling vessels, we expect the albatross would easily avoid the vessel. Additionally, this species does not breed in the proposed project area; therefore, we expect the proposed action would not affect short-tailed albatross.

Summary

We conclude that the proposed action is not likely to adversely affect listed species or designated critical habitat under the Service's jurisdiction. Thank you for your cooperation in meeting our joint responsibilities under the Act. If you need further assistance, please contact Amal Ajmi at (907) 456-0324.

Sincerely,

Ted Swem
Endangered Species Coordinator

4

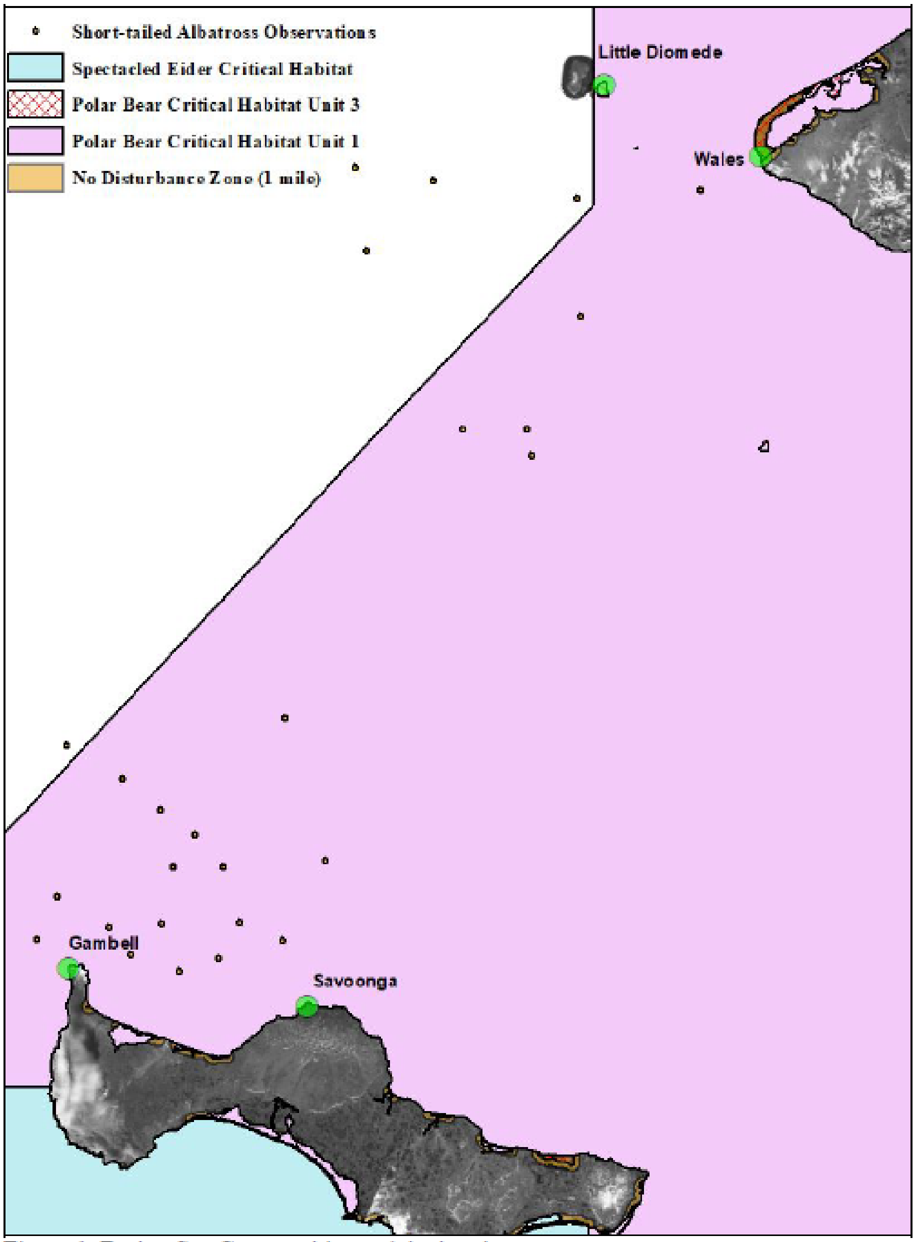

Figure 1. Bering Sea Communities and Action Area.

5

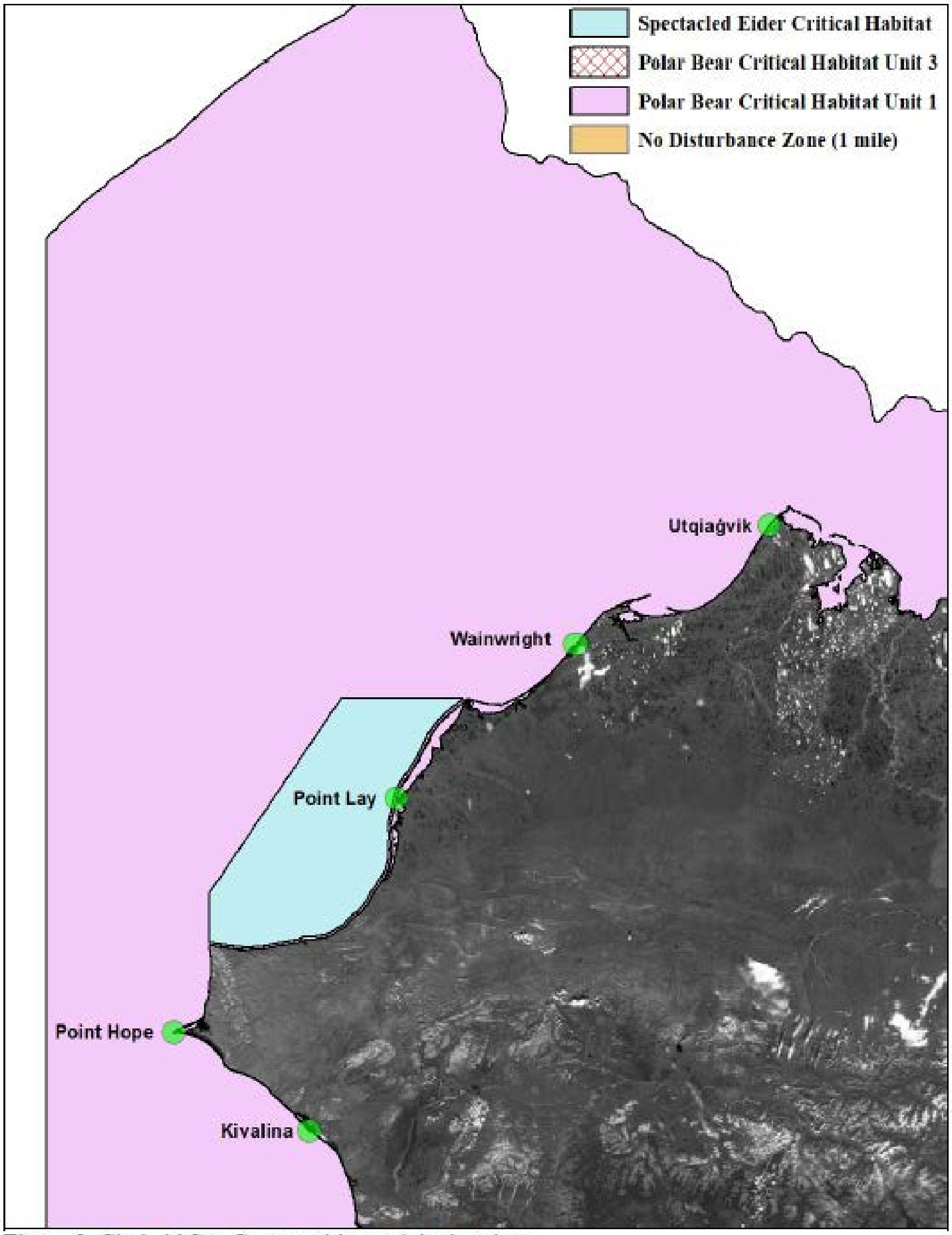

Figure 2. Chukchi Sea Communities and Action Area.

6

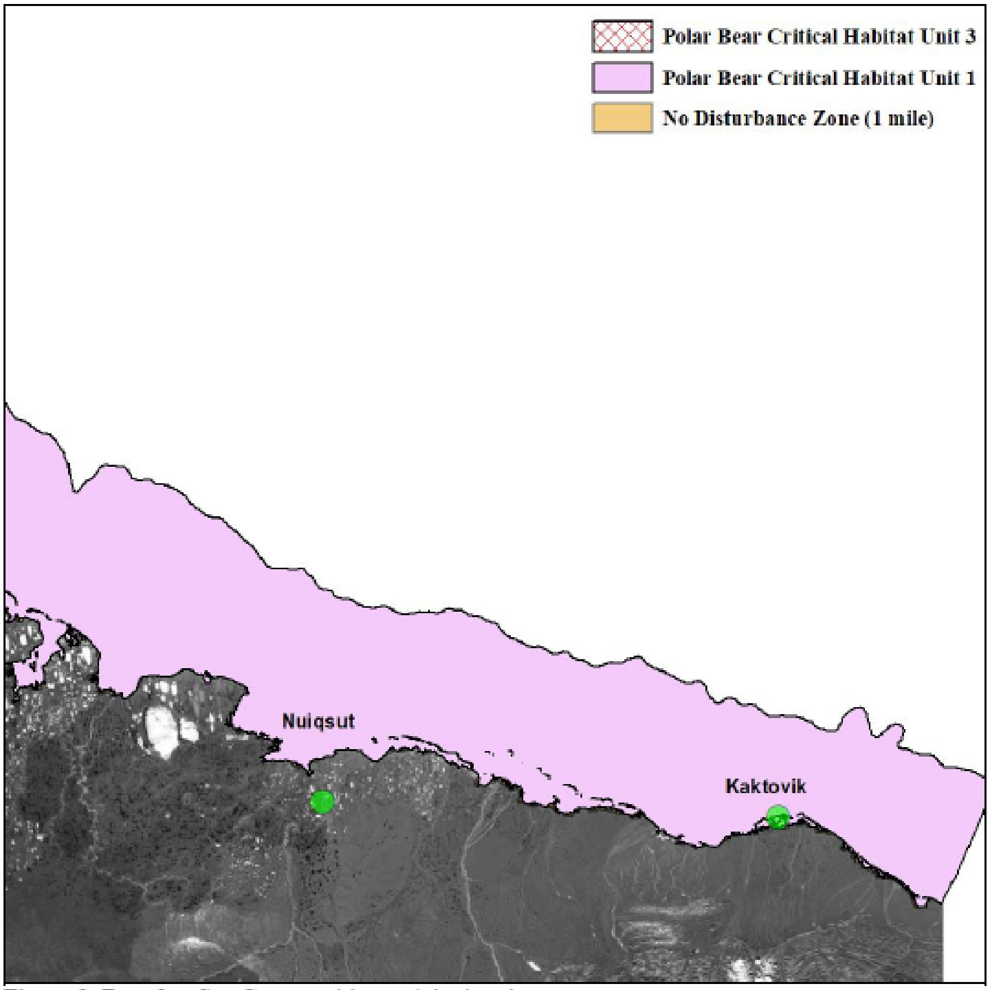

Figure 3. Beaufort Sea Communities and Action Area.

7

8.4.2 National Marine Fisheries Service – Alaska Region

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
P.O. Box 21668
Juneau, Alaska 99802-1668

November 6, 2018

MEMORANDUM FOR: John Henderschedt
Director, Office of International Affairs and Seafood Inspection

FROM: for James W. Balsiger, Ph.D.
Administrator, Alaska Region

SUBJECT: Biological Opinion on the Issuance of Annual Quotas Authorizing the Harvest of Bowhead Whales to the Alaska Eskimo Whaling Commission for the years 2019 and beyond (AKR-2018-9799)

This document transmits the National Marine Fisheries Service's (NOAA Fisheries) Biological Opinion regarding the issuance of annual quotas to the Alaska Eskimo Whaling Commission, allowing for the harvest of bowhead whales, and its effects on the endangered bowhead whale in accordance with section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq.*). A complete administrative record of this consultation is on file at the NOAA Fisheries offices in Juneau, Alaska.

NOAA Fisheries, Office of International Affairs, requested formal consultation on this matter by letter dated June 22, 2018. In formulating this Biological Opinion, NOAA Fisheries used information presented in a preliminary version of the 2018 Final Environmental Impact Statement for Issuing Annual Quotas to the Alaska Eskimo Whaling Commission for a Subsistence Hunt on Bowhead Whales for the years 2019 and beyond, reports from the International Whaling Commission, its Scientific Committee and its Subcommittee on Aboriginal Whaling, along with other research relating to bowhead whales and information provided by NOAA's Marine Mammal Laboratory, the North Slope Borough, the Alaska Eskimo Whaling Commission, and the traditional knowledge of the Alaskan Eskimo community.

NOAA Fisheries concludes the proposed action is not likely to jeopardize the continued existence of the bowhead whale or North Pacific right whale. No critical habitat has been designated for bowhead whales, and critical habitat for North Pacific right whales is located far from the action area, so no critical habitat will be affected by the proposed action. Reasonable and Prudent Measures and Conservation Recommendations are provided with the Biological Opinion which are intended to monitor the effects of the action, improve our understanding of the impacts of subsistence harvest of bowheads on threatened and endangered species, and minimize or mitigate adverse effects.

ALASKA REGION - http://alaskafisheries.noaa.gov

This biological opinion concludes the consultation for this proposed action. Reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of this action that may affect listed species in a manner or to an extent not considered in this biological opinion; (3) the identified action is subsequently modified in a manner that causes an effect to the listed species or designated critical habitat in a manner or to an extent that was not considered in this biological opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action.

If you have questions regarding the opinion, contact me or Greg Balogh in the Alaska Region at (907) 271-3023.

Cc: Carolyn Doherty (carolyn.doherty@noaa.gov)
Roger Eckert (roger.b.eckert@noaa.gov)

8.5 Mailing List

8.5.1 U.S. Congress Members

Senator Lisa Murkowski
Senator Dan Sullivan
Representative Don Young

8.5.2 Government Agencies

U.S. Environmental Protection Agency, Region 10

Jennifer Curtis, Alaska Operations Office

U.S. Fish and Wildlife Service

Robert J. Henszey, Ph.D., Branch Chief, Planning and Consultation
Amal Ajmi, Fish & Wildlife Biologist, Planning and Consultation
Ted Swem, Endangered Species Coordinator, Fairbanks Fish and Wildlife Field Office

Alaska Department of Fish & Game

Lori Quakenbush, Arctic Marine Mammal Program

Marine Mammal Commission

Peter Thomas, Executive Director

National Oceanic and Atmospheric Administration (NOAA)

Roger Eckert, Fisheries and Protected Resources Section, NOAA Office of the General Counsel

NOAA Fisheries / National Marine Fisheries Service (NMFS)

Dr. Doug DeMaster, Science and Research Director, Alaska Region
Ryan Wulff, Assistant Regional Administrator and Acting U.S. Commissioner to the IWC, Sustainable Fisheries Division, West Coast Region
Carolyn Doherty, Office of International Affairs and Seafood Inspection

Kim Shelden, Marine Mammal Laboratory, Alaska Fisheries Science Center
Greg Balogh, Alaska Region Protected Resources Division
Dr. Shannon Bettridge, Marine Mammal and Sea Turtle Conservation Division Office of Protected Resources
Dr. Robyn Angliss, Marine Mammal Laboratory, Alaska Fisheries Science Center
Jon Kurland, Alaska Region Protected Resources Division

U.S. Department of State

Elizabeth Phelps, Office of Ocean and Polar Affairs, Bureau of Oceans and International Environmental and Scientific Affairs

8.5.3 North Slope Borough

Mayor Harry K. Brower, Jr.
Taqulik Hepa, Director, Department of Wildlife Management

8.5.4 Tribal and Native Organizations

George Edwardson, President, Inupiat Community of the Arctic Slope
Josiah B. Patkotak, Vice President, Inupiat Community of the Arctic Slope

8.5.5 Other Native Groups

Alaska Eskimo Whaling Commission

Arnold Brower, Executive Secretary
Jessica S. Lefevre, Counsel

Alaska Beluga Whale Committee

Willie Goodwin, Chairman
Robert Suydam, North Slope Borough Department of Wildlife Management

8.5.6 Non-Governmental Organizations

Animal Welfare Institute

D.J. Schubert, Wildlife Biologist

Whale and Dolphin Conservation Society

Sue Fisher, Policy Director, WDCS North America

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8.6. Public Comments Received

8.6.1 Alaska Bering Sea Crabbers (ABSC), letter dated July 20, 2018

ALASKA
Bering Sea Crabbers

206.783.0188 | 4005 20th Avenue W, Suite 102 | Seattle, WA 98199
alaskaberingseacrabbers.com

July 20, 2018

Carolyn Doherty
Office of International Affairs and Seafood Inspection
NOAA Fisheries
1315 East-West Highway
Silver Spring, MD 20910

Subject: Comment on DEIS for subsistence hunt
of bowhead whales (NOAA–NMFS–2017–0098)

Dear Ms. Doherty:

The Alaska Bering Sea Crabbers (ABSC) appreciates the opportunity to comment on the *Draft Environmental Impact Statement (DEIS) for Issuing Annual Catch Limits to the Alaska Eskimo Whaling Commission for a Subsistence Hunt on Bowhead Whales for the Years 2019 and Beyond (Notice of Availability, 83 FR 27756, 6/14/2018)*.

ABSC is a trade association representing independent crab harvesters in the Bering Sea. Our members commercially fish for king, opilio (snow), and bairdi (tanner) crab with pot gear and hold approximately 70% of the quota in the Bering Sea Aleutian Islands Crab Rationalization Program. ABSC offers comments on the fishery interactions (Section 3.2.6) and the cumulative effects (Section 4.7) sections of the DEIS and our continued commitment to monitoring and research to better understand fishery impacts on this endangered species.

In Section 3.2.6, *Fishery Interactions*, the DEIS notes some bowhead whales show scarring from entanglement with fishing gear. It goes on to state that the gear is likely commercial pot gear, with a study estimating entanglements with commercial pot gear (crab or codfish pots) affects ~12% of bowhead whales. The DEIS also noted that bowhead whales are found in the same areas as commercial pot gear but not during the same times, hinting that fishery interactions may be happening with derelict (or lost) gear. For example, a dead bowhead found in 2015 was entangled with commercial crab pot gear from the 2012/2013 St. Matthews blue king crab fishery.

In Section 4.7, *Cumulative Effects of the Alternatives and Other Activities in the Project Area on the Western Arctic Bowhead Whale Stock*, under Commercial Fishing, the DEIS notes on page 174 that, "*…The continued growth of the bowhead population, however, indicates that commercial fisheries interactions are not precluding the recovery of this endangered species. Nevertheless, the effects of commercial fishing likely have a minor to moderate effect on the bowhead whale population through entanglement in derelict gear*."

ABSC is working to better understand the impacts of the Bering Sea crab fishery on bowhead whales, in part, by coordinating with the Alaska Eskimo Whaling Commission (AEWC), the North Slope Borough (NSB), NOAA Fisheries, and other agencies on research and monitoring. As described on page 51 of the DEIS, "*At the 2018 AEWC annual convention of whaling captains, the Alaska Bering Sea Crabbers attended and gave a presentation on their operations. In the discussion, they indicated their interest in engaging with AEWC and NSB to increase communication regarding bycatch, help determine the source of recovered gear (whether active or ghost gear), and availability to examine any new gear recovered from whales to assess gear-type and origin (Craig George, pers. comm; 2018).*"

ABSC fully intends to continue these efforts and others as new information and opportunities develop. In particular, ABSC would like to offer our services to help identify any gear found entangled on bowhead whales to better identify which fisheries are causing the impact.

We look forward to working together to better understand fishery impacts on bowhead whales.

Sincerely,

Jamie Goen
Executive Director
Alaska Bering Sea Crabbers
absc.jamie@gmail.com

cc: Alaska Eskimo Whaling Commission

Page **2** of **2**

8.6.2 The State of Alaska Department of Fish and Game (ADF&G) Division of Wildlife Conservation, letter dated July 23, 2018

THE STATE of ALASKA
GOVERNOR BILL WALKER

Department of Fish and Game

DIVISION OF WILDLIFE CONSERVATION
Headquarters

P.O. Box 115526
Juneau, Alaska 99811
Main: 907.465.4190

Submitted electronically via www.regulations.gov

July 23, 2018

Carolyn Doherty
Office of International Affairs and Seafood Inspection
NOAA Fisheries
1315 East-West Highway
Silver Spring, MD 20910

Re: NOAA-NMFS-2017-0098; DEIS for Issuing Annual Catch Limits to the Alaska Eskimo Whaling Commission for a Subsistence Hunt on Bowhead Whales for the Years 2019 and Beyond

Dear Ms. Doherty:

The State of Alaska, through the Alaska Department of Fish and Game (ADF&G), submits these comments to the National Marine Fisheries Service (Service) on the Draft Environmental Impact Statement (DEIS) for issuing annual catch limits to the Alaska Eskimo Whaling Commission for the subsistence harvest of bowhead whales for 2019 and beyond.

The State of Alaska supports the continued subsistence hunt of bowhead whales as an important and sustainable harvest that provides substantial nutritional and cultural value to many Alaskans. The current annual harvest level (67 strikes), as described in Alternative 3, was established in 1997 when the bowhead population was estimated to be 8,160 whales (Zeh and Punt 2005). Under this harvest regime the population has doubled to approximately16,820 whales (range 15,176–18,643), using estimates accepted by the International Whaling Commission based on the 2011 ice-based survey conducted near Point Barrow, Alaska.

It is clear that the current level of harvest is sustainable and has allowed the population to grow considerably. Therefore, the current level of 67 strikes (with carryover) is not likely to jeopardize the continued existence of the Western Arctic stock of bowhead whales. Indeed, in our comments on the Notice of Intent to Prepare an EIS dated September 14, 2017, we suggested that an additional alternative should be included in the DEIS that allows for a higher level of harvest if a need for the increase can be demonstrated. Higher allowable harvests based on the greater availability of bowhead whales could replace reduced harvests of other resources (e.g., walruses) that have occurred in recent years due to changes in weather and sea ice preventing access to animals. It appears that Alternative 4 (the preferred alternative) allows for this concern; therefore we support Alternative 4. Although Alternative 5 allows for an even higher level of harvest that could be sustained by the large and growing bowhead population, it appears that this level of harvest is above what is currently needed for subsistence. Therefore we agree with the Service that Alternative 4 is the Preferred Alternative and best meets the purpose and need by achieving the socio-cultural benefits of the subsistence hunt with minimal effects to the bowhead population.

ADF&G works with the Alaska Eskimo Whaling Commission, the North Slope Borough, and others to conduct bowhead whale research that has documented many aspects of bowhead whale movements and behavior (Quakenbush et al. 2018), including fall migration routes across the Chukchi Sea (Quakenbush et al. 2010a, Citta et al. 2017); seasonal use areas (Quakenbush et al. 2012, Citta et al. 2012, Christman et al. 2013, Citta et al. 2015, Harwood et al. 2017); and interactions with oil and gas activities (Quakenbush et al. 2010b). These publications and reports are available on our ADF&G website:
http://www.adfg.alaska.gov/index.cfm?adfg=marinemammalprogram.publications

Thank you for the opportunity to provide comments and information for the DEIS on bowhead whale subsistence catch limits. We look forward to working cooperatively with the Service as the EIS process proceeds.

Sincerely,

Bruce Dale
Director, ADF&G Division of Wildlife Conservation

Cc:
Maria Gladziszewski—Deputy Director, ADF&G Division of Wildlife Conservation
Chris Krenz—Wildlife Science Coordinator, ADF&G Division of Wildlife Conservation
Lori Polasek—Coordinator, ADF&G Marine Mammal Program
Lori Quakenbush— Wildlife Biologist, ADF&G Marine Mammal Program
Moira Ingle—Wildlife Biologist, ESA Coordinator, Threatened, Endangered, and Diversity Program

Literature Cited

Citta, J.J., L.T. Quakenbush, J.C. George, R.J. Small, M.P. Heide-Jørgensen, H. Brower, B. Adams, and L. Brower. 2012. Winter movements of bowhead whales (*Balaena mysticetus*) in the Bering Sea. Arctic 65(1):13–34.

Citta, J.J., L.T. Quakenbush, S.R. Okkonen, M.L. Druckenmiller, W. Maslowski, J. Clement-Kinney, J.C. George, H. Brower, R.J. Small, C.J. Ashjian, L.A. Harwood, and M.P. Heide-Jørgensen. 2015. Ecological characteristics of core-use areas used by Bering-Chukchi-Beaufort (BCB) bowhead whales, 2006–2012. Progress in Oceanography 136:201–222.

Citta, J.J., S.R. Okkonen, L.T. Quakenbush, W. Maslowski, R. Osinski, J.C. George, R.J. Small, H. Brower Jr., M.P. Heide-Jørgensen, and L.A. Harwood. 2017. Oceanographic characteristics associated with autumn movements of bowhead whales in the Chukchi Sea. Deep Sea Research Part II: Topical Studies in Oceanography. http://dx.doi.org/10.1016/j.dsr2.2017.03.009

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Harwood, L.A., L.T. Quakenbush, R.J. Small, J.C. George, J. Pokiak, C. Pokiak, M.P. Heide-Jørgensen, E.V. Lea, and H. Brower. 2017. Movements and inferred foraging by bowhead whales in the Canadian Beaufort Sea during August and September, 2006–12. Arctic 70(2):161–176.

Quakenbush, L.T., J.J. Citta, J.C. George, R.J. Small, M.P. Heide-Jørgensen. 2010a. Fall and winter movements of bowhead whales (*Balaena mysticetus*) in the Chukchi Sea and within a potential petroleum development area. Arctic 63(3):289–307.

Quakenbush, L.T., R.J. Small, and J.J. Citta. 2010b. Satellite tracking of western Arctic bowhead whales. Final Report to Bureau of Ocean Energy Management, Regulation and Enforcement OCS Study BOEMRE 2010-033. 65 pp.

Quakenbush, L., J. Citta, J.C. George, M.P. Heide-Jørgensen, R. Small, H. Brower, L. Harwood, B. Adams, L. Brower, G. Tagarook, C. Pokiak, and J. Pokiak. 2012. Seasonal movements of the Bering-Chukchi-Beaufort stock of bowhead whales: 2006–2011 satellite telemetry results. SC/64/BRG1 International Whaling Commission.

Quakenbush, L., J. Citta, J.C. George, M.P. Heide-Jørgensen, H. Brower, L. Harwood, B. Adams, C. Pokiak, J. Pokiak, and E. Lea. 2018. Bering-Chukchi-Beaufort stock of bowhead whales: 2006–2017 satellite telemetry results with some observations on stock sub-structure. SC/67B/AWMP/04 International Whaling Commission.

Zeh, J. E., and Punt, A. E. (2005). Updated 1978-2001 abundance estimates and their correlations for the Bering-Chukchi-Beaufort Seas stock of bowhead whales. Journal of Cetacean Research and Management, 7(2):169–175.

8.6.3 U.S. Environmental Protection Agency (EPA), letter dated July 25, 2018

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10
1200 Sixth Avenue, Suite 155
Seattle, WA 98101-3140

OFFICE OF
ENVIRONMENTAL REVIEW
AND ASSESSMENT

July 25, 2018

John Henderschedt, Director
NOAA National Marine Fisheries Service
Office of International Affairs and Seafood Inspection
Attn: Carolyn Doherty
1315 East-West Highway
Silver Spring, Maryland 20910

Dear Mr. Henderschedt:

The U.S. Environmental Protection Agency has reviewed the National Oceanic and Atmospheric Administration (NOAA)'s Draft Environmental Impact Statement for the Issuing of Annual Catch Limits to the Alaska Eskimo Whaling Commission for a Subsistence Hunt on Bowhead Whales for the Years 2019 and Beyond (EPA Region 10 Number 17-0037-NOA; CEQ No. 20180111) pursuant to Section 309 of the Clean Air Act and the National Environmental Policy Act.

Based on our review, the DEIS provides an adequate discussion of the potential environmental impacts, and we have not identified any potential impacts requiring substantive changes to the proposal. Because this action may result in the need for transport and disposal of whale carcasses in ocean waters, please be aware of the EPA's General Permit for Ocean Disposal of Marine Mammal Carcasses under the Marine Protection, Research, and Sanctuaries Act[1]. The permit authorizes, through specific conditions for Alaska Natives in subsistence uses[2], the transport and disposal of marine mammal carcasses in ocean waters.

EPA has rated the DEIS as LO – "Lack of Objections." A summary of the EPA's rating is attached for your reference. We appreciate the opportunity to review this DEIS and look forward to reviewing the final EIS related to this proposed action. If you have any questions regarding these comments, the staff contact for this project is Theo Mbabaliye. He may be reached at (206) 553-6322 or via email at Mbabaliye.theogene@epa.gov.

Sincerely,

pp [signature]

Jill A. Nogi, Manager
Environmental Review and Sediment Management Unit

Enclosure:

1. U.S. Environmental Protection Agency Rating System for Draft Environmental Impact Statements

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1 https://www.epa.gov/ocean-dumping/ocean-disposal-marine-mammal-carcasses

2 https://www.epa.gov/sites/production/files/2017-6/documents/mprsa_mmc_general_permit_section_b_reporting_form_0.pdf

8.6.4 Marine Mammal Commission (MMC), letter dated July 31, 2018

MARINE MAMMAL COMMISSION

31 July 2018

Ms. Carolyn Doherty
Office of International Affairs and Seafood Inspection
National Marine Fisheries Service
1315 East-West Highway
Silver Spring, MD 20910-3225

Dear Ms. Doherty:

The Marine Mammal Commission (the Commission), in consultation with its Committee of Scientific Advisors on Marine Mammals, has reviewed the National Marine Fisheries Service's (NMFS) Draft Environmental Impact Statement for Issuing Annual Catch Limits to the Alaska Eskimo Whaling Commission for a Subsistence Hunt on Bowhead Whales for the Years 2019 and Beyond (EIS) and the associated *Federal Register* notice (83 Fed. Reg. 27756). The Commission submitted scoping comments on this EIS on 14 September 2017. As the Commission noted in those comments, "[s]electing alternative harvest limits to include in the EIS for the subsistence taking of bowhead whales is somewhat challenging because such limits are dependent on actions taken by the International Whaling Commission (IWC), which may reject or seek to modify proposals put forward by subsistence whaling countries."

Although the United States and other subsistence whaling countries have submitted a proposal that includes new bowhead whale subsistence catch limits for 2019 and beyond, it remains uncertain whether the IWC will adopt that proposal. The proposal submitted to the IWC tracks Alternative 4 of the EIS. Thus, at this stage, it makes sense to identify that as the provisional preferred alternative. However, should the IWC adopt some other alternative, NMFS should be ready to consider that the preferred alternative. As noted in section 2.8 of the EIS, "NMFS is required to implement IWC Schedule provisions, including provisions regarding catch limits."

The Commission agrees with NMFS's assessment that Alternative 1 is unacceptable for several reasons. It fails to meet the overall objective of the proposed action, which is to provide for the cultural and nutritional needs of Alaska Natives, if doing so can be done in a way that does not undermine conservation of the bowhead whale stock. It makes no sense for NMFS to decide not to implement the catch limit adopted by the IWC, given the rigorous process used by the IWC in reviewing the needs of Native communities and the science underlying the sustainability of those catch limits. Alternative 2 is similarly flawed. It makes no sense to decline to implement a carryover provision vetted by and adopted by the IWC as being consistent with the conservation goals of the Convention. Doing so would undermine the hunters' ability to adapt to variable hunting conditions, and ultimately, to satisfy the established needs of the Native communities.

4340 East-West Highway • Room 700 • Bethesda, MD 20814-4498 • T: 301.504.0087 • F: 301.504.0099
www.mmc.gov

Ms. Carolyn Doherty
31 July 2018
Page 2

Alternative 3 reflects the current bowhead whale hunting regime in Alaska. It would allow an annual strike limit of 67 whales and the carryover of up to 15 unused strikes from previous years. Presumably, this would be an acceptable alternative, should the IWC elect not to increase the number of unused strikes that can be carried over, but instead to continue with the status quo. This alternative, which currently is presented as a six-year extension in the EIS, could be extended easily to a seven-year authorization, if that is the duration of the Schedule amendment adopted by the IWC.

Alternative 4, the preferred alternative, would establish the same basic annual strike limit as under Alternative 3 (67 whales per year), but allow more unused strikes from prior years to be carried forward. As noted in the EIS, this higher carryover amount is consistent with advice provided by the IWC's Scientific Committee. Nevertheless, it is the IWC itself, rather than the Scientific Committee, that establishes catch limits. As such, the Commission agrees that this is the alternative that NMFS should implement, but only if the Schedule amendment proposed by the United Sates and others for governing bowhead whale subsistence hunting in 2019 and beyond is adopted at the upcoming IWC meeting. The Commission notes that Alternative 4 reflects a six-year authorization, but the proposed Schedule amendment would cover seven years. The Commission agrees with NMFS's assessment in the EIS that the impacts on bowhead whales and other resources are largely the same whether the IWC adopts a six-year or a seven-year authorization.

As noted in section 1.3.2, Alternative 5 was included in the EIS at the request of the AEWC and others. That alternative would increase the annual strike limit to 100 whales and allow the carryover of unused strikes from previous years of up to 50 percent of the annual strike limit. A total of 504 whales could be landed over a six-year period. Although the Commission understands the reason for this alternative being included in the EIS, it is unlikely that the IWC will adopt such hunting limits. This alternative is not included in the subsistence whaling proposal submitted by the United States and the increased need reflected in it has not been reviewed by the IWC. Just as the Commission believes that the United States should not set bowhead whale hunting limits lower than those authorized by the IWC (absent a compelling reason), it does not support authorizing Alaska Natives to take more whales than authorized by the IWC.

Most troubling to the Commission is the prospect that the United States might authorize subsistence whaling absent approval by the IWC. The EIS broaches the possibility that, if the IWC does not adopt a new bowhead whale catch limit, NOAA "is considering issuing annual quotas for the time period described in the Alternatives under the current IWC Schedule language." The reader is referred to sections 1.1 and 1.2 for additional information on the legal context and regulatory history of such an action. However, scant additional information is provided in those sections[1]. A similar suggestion was made in the previous draft environmental impact statement concerning bowhead whale catch limits, issued in 2012. As the Commission observed at that time, even if arguments can be made that this is legally permissible and scientifically supportable, authorizing subsistence whaling absent explicit approval by the IWC "is fraught with difficulties from a policy perspective." The Commission continues to recommend that this alternative be considered only as a last resort.

[1] In fact, to the extent that there is any analysis, it seems confined to footnote 5 on page 9 of the EIS.

Ms. Carolyn Doherty
31 July 2018
Page 3

Thank you for considering our comments. The Commission looks forward to working as part of the U.S. delegation to the 2018 IWC meeting to secure adoption of the proposed Schedule amendment for updated subsistence whaling catch limits.

Sincerely,

Peter O. Thomas

Peter O. Thomas, Ph.D.,
Executive Director

8.6.5 Alaska Eskimo Whaling Commission (AEWC), letter dated July 31, 2018

ALASKA ESKIMO WHALING COMMISSION
P.O. BOX 570 UTQIAGVIK, ALASKA 99723

July 31, 2018

Via http://www.regulations.gov
Carolyn Doherty
Office of International Affairs and
Seafood Inspection
NOAA Fisheries
1315 East-West Highway
Silver Spring, MD 20910

RE: Alaska Eskimo Whaling Commission (AEWC) Comments on Draft Environmental Impact Statement for Issuing Annual Catch Limits to the Alaska Eskimo Whaling Commission (83 FR 115)

Dear Ms. Doherty:

The AEWC appreciates the opportunity to submit the following comments on NOAA's Draft Environmental Impact Statement for Issuing Annual Catch Limits to the AEWC ((83 FR 115). For the reasons discussed below, the AEWC supports adoption of NMFS' preferred alternative (Alternative 4), which maintains the status quo for the bowhead whale subsistence quota, with minor adjustments for flexibility and fairness.

The AEWC is very proud of our excellent working relationship, of more than 35 years, with NOAA through the NOAA-AEWC Cooperative Agreement, entered in 1981under Section 112 of the Marine Mammal Protection Act. We similarly are proud of our excellent working relationship with the National Marine Fisheries Service and especially with the members of the U.S. Delegation to the International Whaling Commission (IWC).

The 67th meeting of the IWC, scheduled for September 2018 in Florianopolis Brazil, will mark 41 years of AEWC attendance at IWC meetings and compliance with IWC mandates for research, management, and welfare related to our bowhead whale subsistence harvest. As noted in the DEIS, however, 2018 is only the most recent in our thousands of years of harvesting and caring for our bowhead whale stock.

Today, as for millennia past, the bowhead whale and the subsistence harvest play critical roles in the nutritional and cultural health of Alaska's northern communities and are central to the mixed subsistence-cash economy of northern Alaska and of Native communities throughout the State, as noted in Kofinas, et al., 2016, referenced in the DEIS.[1] The Kofinas findings also have been published in the American Anthropologist.[2] These publications help to illustrate the critical importance of the subsistence sharing of food resources to Alaska's Native people. The most important of these shared resources is our bowhead whale, as described in the AEWC's 2018 Need Report, submitted to the IWC.[3]

Since 1977, our whaling captains also have been presenting the IWC with our direct observations of the overall health, including reproductive health, of the Western Arctic bowhead whale population. Disregarding our whaling captains, when the IWC took control of our subsistence harvest in 1977, it asserted that there were no more than 2,000 bowhead whales in the population. Fortunately, in addition to our own observations, we also have been able to call upon the resources of Alaska's North Slope Borough and the world-class researchers of the Borough's Department of Wildlife Management. Thanks to the state-of-the art population research program designed by the Department, with the support and cooperation of our whaling captains, today the IWC Scientific Committee agrees that there are approximately 16,820 whales (based on a 2011 estimate) and that the population is growing at a rate of approximately 3.7 percent.

The IWC set the present level of quota for the bowhead whale subsistence harvest 21 years ago, in 1997, when the size of the population was estimated to be half of the 2011 estimate. The 1997 harvest level was based on Alaskan Eskimo subsistence need, and the carryover of 15 unused strikes was agreed upon to allow for flexibility given the environmental conditions of our harvest. However, most IWC participants are likely unaware that, in 1997, the U.S. and Russia entered a bi-lateral agreement to share the bowhead whale subsistence quota. Under this agreement, almost half (seven) of the strikes allowed for annual carryover belong to the hunters of Chukotka.

Thus the AEWC's harvest allocation over the past 21 years has been 67 strikes per year with eight (8) unused strikes from previous years available for carryover. ***Alternative 4 would: (1) provide the greater flexibility our whaling captains need in the rapidly changing conditions of the Arctic; and (2) address the sacrifice imposed on our whaling captains by the 1997 agreement that seven of our carryover strikes be allocated to Russia. At the same time, the quota allocation under this Alternative remains consistent with the current status quo under IWC Schedule paragraph 13(b) and with the Scientific Committee's management advice.***

The AEWC also would like to note the following, with respect to the IWC's management of the bowhead whale subsistence quota.

[1] Kofinas G, S. BurnSilver, J. Magdanz, R. Stotts, M. Okada. (2016), Subsistence Sharing Networks and Cooperation: Kaktovik, Wainwright and Venetie, Alaska, BOEM Report (Univ of Alaska, Fairbanks, AK) Vol 2015-023.

[2] BurnSilver S, Magdanz J, Stotts R, Berman M, Kofinas G (2016), Are mixed economies persistent or transitional? Evidence using social networks from arctic Alaska. American Anthropologist 118(1):121–129.

[3] Stephen R. Braund & Associates (2018), Description of Alaskan Eskimo Bowhead Whale Subsistence Sharing Practices, Including an Overview of Bowhead Whale Harvesting and Community-Based Need (available at iwc.int/Conservation & Management/Aboriginal Subsistence Whaling).

In 2002, the 1997 IWC harvest authorization, establishing the current quota allocation, expired by its terms. The AEWC and the U.S. requested a renewal of the 1997 harvest level, based on a 2001 bowhead whale abundance estimate of 10,558 whales. The Commission failed to renew the bowhead whale subsistence quota, due to an unrelated dispute among members. Families throughout northern Alaska were given the devastating news that the IWC had failed to act on our harvest authorization and that our nutritionally and culturally critical bowhead whale resource would no longer be legally available to us. A special meeting was required to re-instate the 1997 harvest authorization.

In 2003, the Scientific Committee implemented its Strike Limit Algorithm (SLA) for bowhead whales, the first in its series of SLAs for whale stocks subject to Aboriginal harvests.

In 2007, 10 years after it was originally set, the 1997 harvest authorization again expired by its terms. It was renewed based on the 2001 abundance estimate of 10,558 whales, although the meeting was held under threat that the renewal again might fail.

In 2012, 15 years after it was originally set, the 1997 harvest authorization again expired by its terms. It was renewed based on the 2011 abundance estimate of 16,820 whales, with an estimated rate of increase approaching 3.7 percent.

In 2018, 21 years after it was originally set and 15 years after the bowhead SLA was first implemented, the 1997 harvest authorization again will expire by its terms and again we must go to the IWC, hat in hand, and seek permission to continue feeding our families.

Our people experience indescribable fear and anxiety every time we are faced with our quota expiring.

The International Convention for the Regulation of Whaling does not direct the IWC to set our bowhead whale subsistence quota so that it expires automatically at the end of a defined term. And paragraph 13(a) of the Schedule to the Convention ***requires*** that our quota must be established so long as our harvest does not exceed 90 percent of the Maximum Sustainable Yield (MSY) for the Western Arctic bowhead whale stock. The annual allocation of 67 strikes is less than one-half of one percent of the estimated size of the stock and just one-tenth of the estimated annual net recruitment. That this harvest is sustainable is readily apparent given the continued increase in the population estimate in the presence of our harvest.

The centrality of the bowhead whale subsistence harvest to our nutritional and cultural well-being is unquestioned, as are the stable health of the whale population and the AEWC's outstanding history of resource management and cooperation with the IWC. In light of this history and these factors, continuing the practice of setting our quota with a built-in expiration date is fundamentally unfair to our whaling captains, our families, our communities, and the many who rely upon us to share this critical resource. Rather, this practice serves only to impose a state of persistent uncertainty and anxiety on our people at home and to invite political gamesmanship at the IWC.

The U.S. and the AEWC seek to address this cruel and discriminatory situation through the quota proposal submitted for consideration at the IWC's upcoming meeting. We also note that the request includes a one-time seven-year allocation. The additional year would allow greater time than is currently available between future quota submissions and the implementation of new quota allocations, should the IWC, again, force an expiration of our bowhead whale subsistence quota and fail to act on a renewal request. We support the request for greater time, on the assumption that the harvest allocation would be adjusted accordingly. However we must note that additional time, alone, will not address the inequitable practice of allowing an international body to arbitrarily choose, through inaction, to deny U.S. citizens the legal right to a locally available and critical nutritional and cultural resource.

Thank you for your kind attention to our views.

Sincerely,

John Hopson, Jr.
Chairman

cc: AEWC Commissioners
Mayor Harry Brower
Congressman Don Young
Senator Lisa Murkowski
Senator Dan Sullivan
Admiral Gallaudet
Chris Oliver

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8.6.6 North Slope Borough (NSB), letter dated July 31, 2018

North Slope Borough

OFFICE OF THE MAYOR

P.O. Box 69
Barrow, Alaska 99723
Phone: 907 852-2611 or 0200
Fax: 907 852-0337

Harry K. Brower, Jr. Mayor

July 31, 2018

Carolyn Doherty
Office of International Affairs and
Seafood Inspection
NOAA Fisheries
1315 East-West Highway
Silver Spring, MD 20910

Submitted via http://www.regulations.gov/ and by USPS Mail

RE: Draft Environmental Impact Statement for Issuing Annual Catch Limits to the Alaska Eskimo Whaling Commission (83 FR 115)

Dear Ms. Doherty:

Thank you for the opportunity to comment on the National Marine Fisheries Service's (NMFS) Draft Environmental Impact Statement (EIS) for Issuing Annual Catch Limits to the Alaska Eskimo Whaling Commission (AEWC). As you know, subsistence whaling is a matter of great importance to our communities spiritually, culturally and as an affordable and nutritious source of food. Our regional government, the North Slope Borough, (Borough) contains six of the eleven villages that participate in the bowhead whale hunt and make up AEWC. For forty years the Borough has studied the health of the Western Arctic bowhead stock and provided significant financial and scientific support to AEWC. With the cooperation of AEWC's whaling captains, we have assisted in managing the bowhead harvest and in securing continued harvest authorizations with the International Whaling Commission (IWC). We fully support AEWC and its comments in this matter.

The co-management of the Western Arctic bowhead stock between AEWC and NMFS has been a dramatic success. The regulated take of bowheads, at less than ½ of a percent of their total population per year, has not significantly affected their recovery. As discussed in the Draft EIS, the Western Arctic bowhead population has significantly recovered since the 1970s. Growing at 3.7 percent annually, the current population estimate of this stock (16,820 in 2011) may have returned to, or even exceeded, its pre-commercial whaling level.

Preferred Alternative

We support NMFS' selection of Alternative 4 as the preferred alternative. Alternative 4 allows NMFS to grant AEWC a total of 336 landed whales over a six-year period, with an annual strike limit of 67. This level of harvest was set over 20 years ago when the size of the Western Arctic bowhead stock was estimated at only half of the current population. Alternative 4 also allows the use of a 50 percent annual unused strike carryover, which could allow for up to 100 bowheads to be struck in one year. This alternative appears to be consistent with AEWC's quota request and 50 percent carryover principle to provide greater flexibility and food security to our whaling communities. As evidenced by past levels of take, the disturbance to bowhead whales from Alternative 4 will be relatively minor and will not impact the stock in a significant way.

Seven Year Quota Request, Automatic Renewal and Need for Regulatory Flexibility

In 2018, the United States requested a seven year quota from the IWC, creating a one-year extension beyond the six-year block. Recognizing that the IWC now schedules its meetings late in the year, the additionally year would allow greater time between the submission and implementation of future quota requests. This change would provide added time for action, should the IWC fail to act on a quota request at a regularly scheduled meeting. If the IWC approves this request, NMFS should adjust the quota to accommodate the seven year request.

Another issue that must be addressed is the automatic expiration of the IWC's harvest authorizations. Under IWC's current rules, the bowhead harvest authorization automatically expires at the end of its term. The International Convention for the Regulation of Whaling does not require the IWC to have this rule. This automatic expiration of the harvest authorization has led to gamesmanship amongst IWC member nations, causing hardship and stress in our communities. We believe the IWC should change its rules to automatically renew the bowhead harvest authorization at the end of its term, assuming no change in the management advice from the Scientific Committee and no change in subsistence need.

Additionally, there is a growing need for regulatory flexibility, which is partially addressed with the 50 percent carryover provision of the requested quota, in the Arctic Ocean and Bering Sea. For some whaling communities, the warming climate is altering the resource mix. As these changes continue, it may become necessary to consider the impacts of existing regulations on food availability and security in AEWC's communities.

Conclusion

Thank you for the opportunity to provide comments on NMFS' Draft Environmental Impact Statement for Issuing Annual Catch Limits to the Alaska Eskimo Whaling Commission.

Sincerely,

7-31-18

Harry K. Brower, Mayor

Cc: Senator Lisa Murkowski
Senator Dan Sullivan
Representative Don Young
Admiral Gallaudet, Assistant Secretary of Commerce
Chris Oliver, Assistant Administrator NOAA Fisheries
John Hopson, Jr., AEWC Chairman
Arnold Brower, Jr., AEWC Executive Director

8.7 Public Comment Analysis Report

8.7.1 Public Comment Period and Comment Analysis Report

On June 14, 2018, a Notice of Availability of the Draft Environmental Impact Statement for issuing annual catch limits to the Alaska Eskimo Whaling Commission for a subsistence hunt on bowhead whales for the years 2019 and beyond was published in the Federal Register (83 FR 27756), marking the beginning of the public review period for the document. At the same time, electronic copies of the Draft Environmental Impact Statement (EIS) including appendices were made available to interested governmental agencies and non-governmental organizations who requested copies. The Draft EIS and all of the appendices were also available for review or download online at the National Marine Fisheries Service (NMFS) Alaska Regional Office website. The public review period ended on July 31, 2018.

During the review period, NMFS received a total of six comment letters from the following:

(1) Alaska Bering Sea Crabbers, letter dated July 20, 2018

(2) The State of Alaska Department of Fish and Game (ADF&G) Division of Wildlife Conservation, letter dated July 23, 2018

(3) U.S. Environmental Protection Agency (EPA), letter dated July 25, 2018

(4) Marine Mammal Commission (MMC), letter dated July 31, 2018

(5) Alaska Eskimo Whaling Commission (AEWC), letter dated July 31, 2018

(6) North Slope Borough (NSB), letter dated July 31, 2018

Comments were submitted by and by mail to the NMFS Office of International Affairs and Seafood Inspection. All comments received by or dated July 31, 2018 are included in this Comment Analysis Report (CAR). These documents are included in **Appendix 8.6**.

8.7.2 Response to Public Comments

The National Environmental Policy Act (NEPA) requires government agencies to include in the Final EIS all the substantive comments received on the Draft EIS. The final document must include responses to the comments or comment summaries, if changes to the Draft EIS have been made because of those comments, and an indication of where such changes where made in the document. This CAR serves as the public comment summary and response to comment document for the Draft EIS. It presents the methodology used by NMFS in reviewing and sorting the comments, and it presents a synthesis of all comments that address a common theme. A careful and deliberate approach has gone into ensuring that this report reviews, considers and provides responses to all substantive public comments.

8.7.3 Analysis of Public Comments

Each submission on the Draft EIS was read by at least two individuals to insure that all substantive comments were identified. The term substantive comment refers to an assertion, suggested alternatives or actions, data, background information, or clarifications relating to the Draft EIS document or its preparation. In the comment letters received, similar comments making a common point were summarized together resulting in 19 summary comments for response. These in turn were classified into eight issue categories (**Table 1**). This report organizes the response to comments by issue categories in alphabetical order.

Table 1. Issue Codes and Descriptions

Issue Code	Issue Description
ALT	Alternatives
ANI	Alaska Native Issues
CAI	Cooperative Agreement Implementation
DSN	Demonstrated Subsistence Ned
ESW	Effects of Subsistence Whaling on Bowhead Whales
IA	Impact Analysis
REG	Regulatory Issue
TEK	Traditional Ecological Knowledge

8.7.4 Public Comments and Responses

<u>Alternatives (ALT)</u>

<u>ALT 01</u>

The AEWC, the NSB, and the ADF&G support adoption of Alternative 4, which maintains the status quo for the bowhead whale subsistence quota, with minor adjustments for flexibility and fairness. (AEWC, NSB, and ADF&G)

Response:
This represents an endorsement for the preferred alternative as outlined in Section 2.5.

<u>ALT 02</u>

Alternative 4 is the alternative that NMFS should implement if the Schedule amendment proposed by the United States and others for governing bowhead whale subsistence hunting in 2019 and beyond is adopted at the IWC meeting. (MMC)

Response:
At IWC67 in 2018, the Commission adopted a revised four-country proposal that contains only a slight change to the original Schedule amendment proposal referenced by the MMC regarding the bowhead-specific catch limits of Schedule paragraph 13(b)(1). Compare the revised proposal to amend paragraph 13(b)(1) in document IWC/67/01 Rev 01 with the original proposal in document IWC/67/01.

ALT 03
The Draft EIS provides an adequate discussion of the potential environmental impacts. EPA has rated the Draft EIS as LO – "Lack of Objections." (EPA)

Response:
This comment represents recognition that the EIS meets NEPA analysis standards.

ALT 04
The MMC agrees with NMFS's assessment in the EIS that the impacts on bowhead whales and other resources are largely the same whether the IWC adopts a six-year or a seven-year authorization. (MMC)

Response:
AT IWC67 in 2018, the IWC extended the catch limits for seven years, through 2025. Section 2 of the EIS has been revised to more fully explain how issuance of one-time seven-year catch limits is accounted for in the action Alternatives. The total number of bowhead whales that can be landed over that seven-year period has been increased by 1/6 from 336 to 392, and the total number of bowhead whales that can be landed over any six-year period will remain unchanged at 336. Since the action Alternatives evaluate the impacts of a take of 336 whales over "any" six-year period, they account for a one-time seven-year renewal.

ALT 05
Recognizing that the IWC now schedules its meetings late in the year, a seven-year quota would allow greater time between the submission and implementation of future quota requests. (NSB)

Response:
As indicated in the response to ALT 03, the action Alternatives account for a seven-year catch limts by evaluating the impacts of a take of 336 whales over "any" six-year period.

ALT 06

The centrality of the bowhead whale subsistence harvest to the nutritional and cultural well-being of Alaska Native communities is unquestioned, as are the stable health of the whale population and the AEWC's outstanding history of resource management and cooperation with the IWC. In light of this history and these factors, continuing the practice of setting the bowhead quota with a built-in expiration date is fundamentally unfair to AEWC whaling captains, their families, their communities, and the many who rely upon the AEWC to share this critical resource. (AEWC)

Response:

At IWC67 in 2018, the Commission added an automatic renewal provision, i.e., Schedule paragraph 13(a)(6), for sustainable status quo catch limits. Renewal of status quo bowhead catch limits will automatically occur if the three conditions in Schedule paragraph 13(a)(6) are satisfied. The first automatic renewal could occur in 2024, extending the catch limits for an additional six years from 2026 through 2031. The timeframe for the proposed action evaluated in this EIS is 2019 and beyond, which accounts for the possibility of a renewal of the catch limits. As stated in Section 1.2.7, the EIS provides an estimate of environmental effects for a 25- or 30-year period, recognizing that periodically NMFS would prepare an EA to examine whether any changes in the bowhead population, the subsistence harvest practices, or in cumulative effects would constitute significant effects requiring an EIS. Section 2 of the EIS has been revised to more fully explain how the action Alternatives account for the possibility of an automatic renewal of bowhead catch limits. Specifically, since the action Alternatives evaluate the impacts of a take of 336 whales over "any" six-year period, they account for the possibility of automatic renewals.

Alaska Native Issues (ANI)

ANI 01

The bowhead whale and the subsistence harvest play critical roles in the nutritional and cultural health of Alaska's northern communities and are central to the mixed subsistence-cash economy of northern Alaska and of Native communities throughout the State. (AEWC and NSB)

Response:

Sections 1.1.4, 3.2.1, and 3.4 describe the critical role of the bowhead whale and the subsistence harvest in the nutritional and cultural health of Native communities throughout the state, including the subsistence-cash economy and the sharing aspect of subsistence use.

<u>**Cooperative Agreement Implementation (CAI)**</u>

<u>**CAI 01**</u>
The co-management of the Western Arctic bowhead stock between the AEWC and NMFS has been a dramatic success. The regulated take of bowheads, at less than ½ of a percent of their total population per year, has not significantly affected their recovery. (NSB)

Response:
Sections 1.1.3 and 3.2.1 describe the improving status of the Western Arctic bowhead whale stock. Sections 1.2.4 and 3.6 describes the co-management relationship between the AEWC and NMFS.

<u>**CAI 02**</u>
The NSB has invested heavily in the study and protection of bowhead whale populations. For forty years the Borough has studied the health of the Western Arctic bowhead stock and provided significant financial and scientific support to the AEWC. (NSB)

Response:
The North Slope Borough's support for and investment in the study of bowhead whale populations is discussed in Section 1.2.4.

<u>**Demonstrated Subsistence Need (DSN)**</u>

<u>**DSN 01**</u>
The Draft EIS acknowledges the critical importance of the bowhead whale harvest to meet the needs of AEWC communities. (AEWC and NSB)

Response:
The purpose of the EIS, as stated in Section 1.1.1 and 1.2.2, is to fulfill the federal responsibilities by recognizing the nutritional and cultural needs of Alaska Natives.

<u>**Effects of Subsistence Whaling on Bowhead Whales (ESW)**</u>

<u>**EWS 01**</u>
The Final EIS should include data from the NSB scientists, which shows that the bowhead whale stock is increasing and that the bowhead hunt is sustainable. (NSB)

Response:
Section 3.2.1 includes data shat show that the Western Arctic bowhead whale stock is increasing and that the bowhead subsistence hunt is sustainable.

ESW 02

Since 1977, AEWC whaling captains have been presenting the IWC with direct observations of the overall health, including reproductive health, of the Western Arctic bowhead whale population. (AEWC)

Response:

Section 3.2.1 provides information showing that the Western Arctic bowhead whale stock is increasing.

Impact Analysis (IA)

IA 01

EPA concluded that the Draft EIS provides an adequate discussion of the potential environmental impacts, and that EPA did not identify any potential impacts requiring substantive changes to the proposal. (EPA)

Reponse:

Comment acknowledged.

IA 02

ABSC note their continued commitment better understand the impacts of the Bering Sea crab fishery on bowhead whales, including the effects of entanglements in and/or scarring from commercial pot gear, in part, by coordinating with the Alaska Eskimo Whaling Commission (AEWC), the North Slope Borough (NSB), NOAA Fisheries, and other agencies on research and monitoring. (ABSC)

Response:

Comment acknowledged.

Regulatory Issue (REG)

REG 01

The Draft EIS fails to sufficiently articulate the basis for NMFS's conclusion that if the IWC does not set numeric catch limits for a year in the Schedule, NOAA will establish catch limits. The MMC continues to recommend that this be considered only as a last resort. (MMC)

Response:

Additional language has been added to Sections 1.2.2 and 1.2.3. As explained in those Sections, the IWC Schedule requires that aboriginal subsistence whaling catch limits be set according to certain enumerated principles, and requires that such whaling shall be conducted under national legislation. There is also specific IWC approval of aboriginal subsistence whaling for Western Arctic bowhead whales. Any action by NMFS with regard to this whaling must be in compliance with the Schedule, as well as the Whaling Convention Act (WCA). If the Schedule does not specify numeric catch limits, then NOAA must determine those limits under the WCA. Moreover, at IWC67 in 2018, the Commission added an automatic renewal provision to Schedule paragraph 13(a) for sustainable status quo catch limits. Provided the three conditions of paragraph 13(a)(6) are satisfied, no further Schedule amendments will be necessary for continuation of a status quo bowhead hunt.

REG 02

When the IWC failed to renew the bowhead whale subsistence quota at its annual meeting in 2002, the nutritionally and culturally critical bowhead whale resource would no longer be legally available to families throughout northern Alaska. A special IWC meeting was required to reinstate the harvest authorization. (AEWC)

Response:

As indicated in the response to comment REG 01, and elaborated more fully in Sections 1.2.2 and 1.2.3 of the EIS, the Schedule authorizes the bowhead hunt, and NOAA must determine applicable numeric catch limits if they are not specified in the Schedule. Moreover, at IWC67 in 2018, the Commission added an automatic renewal provision to Schedule paragraph 13(a) for sustainable status quo catch limits.

REG 03

The International Convention for the Regulation of Whaling does not direct the IWC to set the Western Arctic bowhead subsistence quota so that it expires automatically at the end of a defined term. And paragraph 13(a) of the Schedule to the Convention requires that this quota must be established so long as the bowhead harvest does not exceed 90 percent of the Maximum Sustainable Yield for the Western Arctic bowhead whale stock. (AEWC)

Response:

As indicated in the responses to comments REG 01 and REG 02, and elaborated more fully in Sections 1.2.2 and 1.2.3 of the EIS, the Schedule authorizes the bowhead hunt, and NOAA must determine applicable numeric limits if they are not specified in the Schedule.

REG 04

Selection of the no action or the no carry forward alternatives would be contrary to law. (AEWC)

Response:
Under NEPA, a federal agency can examine an alternative that would require new action by another jurisdiction (i.e., a change in regulation or statute) and this would be analogous to an alternative, such as the no action alternative or the no carry forward alternative, which would require a new action by the IWC. NMFS recognizes that the Whaling Convention Act (WCA) provides, in part, that the Secretary of Commerce is directed to administer and enforce all of the provisions of the ICRW and the Schedule (see 16 U.S.C. 916j), and that Schedule provisions "shall become effective" with respect to all persons and vessels subject to U.S. jurisdiction. See 16 U.S.C. 916k. NMFS also recognizes that: (1) paragraph 13(a) of the Schedule provides, in part, that aboriginal subsistence whaling catch limits "to satisfy aboriginal subsistence need … shall be established in accordance with" certain enumerated principles; (2) paragraph 13(b)(1) of the Schedule provides, in part, that the taking of Western Arctic bowhead whales by aborigines "is permitted," subject to certain limitations; and that (3) paragraph 13(b)(1) of the Schedule further provides, in part, that unused strikes "shall be carried forward," subject to certain limitations as well. Accordingly, the no action alternative and the no carry forward alternatives would require new action by the IWC to amend the Schedule, or action by Congress to amend the WCA.

Traditional Ecological Knowledge (TEK)

TEK 01
The EIS should state that the AEWC whaling captains have extensive traditional knowledge of the Arctic ecosystem and bowhead whales, much of which has been validated by Western science. (AEWC)

Response:
Section 3.2.1, 3.5, and 3.5.1 highlight the value of traditional ecological knowledge for understanding the subsistence bowhead hunts and potential effects of the alternatives reviewed in the EIS.

TEK 02
The EIS should note that the extensive research undertaken by Alaska Native organizations, in response to IWC action, has demonstrated that bowhead stocks are stable and that the traditional knowledge of Alaska Natives was accurate. (AEWC)

Response:
Alaska Native organizations' support for and investment in the study of bowhead whale populations is discussed in Section 1.2.4. Section 3.2.1 reviews the status of the bowhead stock,

and NMFS agrees the Western Arctic bowhead whale population is healthy and growing under a managed hunt.

9.0 INDEX

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