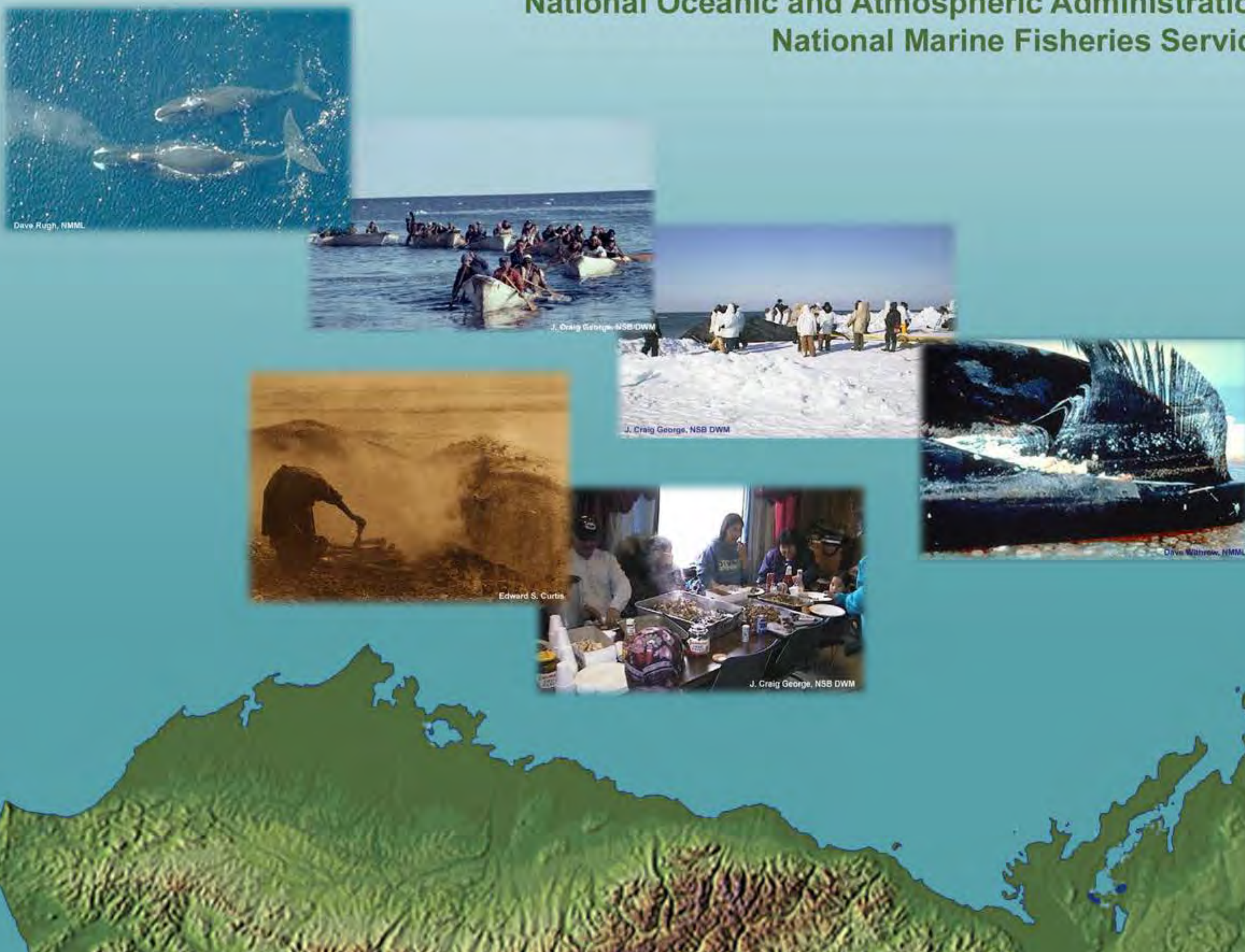
DRAFT
ENVIRONMENTAL IMPACT STATEMENT
FOR ISSUING ANNUAL QUOTAS TO THE ALASKA ESKIMO WHALING COMMISSION FOR A SUBSISTENCE HUNT ON BOWHEAD WHALES FOR THE YEARS 2013 THROUGH 2017/2018

June 2012

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



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UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
PROGRAM PLANNING AND INTEGRATION
Silver Spring, Maryland 20910

JUN 1 2012

Dear Reviewer:

In accordance with provisions of the National Environmental Policy Act (NEPA), we enclose for your review the *Draft Environmental Impact Statement (DEIS) for Issuing Annual Quotas to the Alaska Eskimo Whaling Commission (AEWC) for a Subsistence Hunt on Bowhead Whales for the Years 2013- through 2017/2018.*

This DEIS was prepared pursuant to NEPA to assess the environmental impacts associated with NOAA's issuance of an annual subsistence hunt quota. In June 2012, the International Whaling Commission will consider reauthorizing the subsistence hunt catch limit for another five or six years. NOAA's proposed action is to issue annual quotas to the AEWC subject to the terms and conditions of the co-management agreement between the Agency and the Commission. The purpose of this action is twofold: to manage the conservation and subsistence utilization of the western Arctic stock of bowhead whales (as required by the Marine Mammal Protection Act, the Whaling Convention Act, and other applicable laws) and to fulfill the Federal Government's trust responsibility to recognize the cultural and subsistence needs of Alaska Natives.

Additional copies of the DEIS may be obtained from the Responsible Program Manager identified below. The document is also accessible electronically through the NMFS Alaska Region's website at http://www.fakr.noaa.gov/analyses/bowhead/eis/default.htm.

A 60-day public comment period is being provided upon release of this DEIS. The comment period will end on August 14, 2012. Comments on this action must be submitted by one of the following methods to ensure that the comments are received, documented, and considered by NMFS. Comments sent by any other method, to any other address or individual, or received after the end of the comment period, may not be considered. Any comments on this document must be identified by [NOAA–NMFS–2011–0225]. All comments received are a part of the public record and will generally be posted for public viewing on http://www.regulations.gov without change. All personal identifying information (e.g., name, address, etc.) submitted voluntarily by the sender will be publicly accessible. Do not submit confidential business information, or otherwise sensitive or protected information. NMFS will accept anonymous comments (enter ''N/A'' in the required fields if you wish to remain anonymous). Attachments to electronic comments will be accepted in Microsoft Word or Excel, WordPerfect, or Adobe PDF file formats only.

Comments are to be submitted to: Douglas P. DeMaster
Attn: Steven K. Davis
NOAA National Marine Fisheries Service

• Mail: 709 W. 9th Street, P.O. Box 21668, Juneau, AK 99802–1668.
• Hand Delivery to the Federal Building: 709 West 9th Street, Room 420A, Juneau, AK.
• Fax: 907–586–7557.
• Electronic Submission: Submit all electronic public comments via the Federal e-Rulemaking Portal http://www.regulations.gov.

To submit comments via the e-Rulemaking Portal, first click the ''submit a comment'' icon, then enter [NOAA–NMFS–2011–0225] in the keyword search. Locate the document you wish to comment on from the resulting list and click on the ''Submit a Comment'' icon on the right of that line. Include in the subject line the following document identifier: Bowhead Whale Quota EIS.

Sincerely,

for

Patricia A. Montanio
NOAA NEPA Coordinator

Enclosure

Draft Environmental Impact Statement
for
Issuing Annual Quotas to the Alaska Eskimo Whaling Commission for a Subsistence Hunt on Bowhead Whales for the Years 2013 through 2017 or 2018

June 2012

Lead Agency: USDC National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Alaska Region
Juneau, Alaska, and Seattle, Washington

Responsible Official: Douglas P. DeMaster, Director, Alaska Fisheries Science Center

For Further Information Contact: Alaska Regional Office, Attn: Ellen Sebastian
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Cooperating Agencies: Alaska Eskimo Whaling Commission

Abstract: The National Marine Fisheries Service (NMFS) proposes to authorize subsistence harvests of the Western Arctic stock of bowhead whales for the years 2013 through 2017 or 2018, under the Whaling Convention Act, and a cooperative agreement with the Alaska Eskimo Whaling Commission (AEWC). Under the International Convention for the Regulation of Whaling, the International Whaling Commission (IWC) approves overall five-year or six-year 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. On an annual basis, NMFS can issue the AEWC the Alaskan share of this catch limit. The subsequent hunt is managed under the Whaling Convention Act, cooperatively by NMFS and the AEWC. The purpose of this action is twofold: to manage the conservation and subsistence utilization of the Western Arctic stock of bowhead whales (as required under the Marine Mammal Protection Act [MMPA], the Whaling Convention Act, 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 will conduct its next meeting in June and July 2012 in Panama City, Panama, and based on the management advice of the IWC Scientific Committee, is likely to adopt a catch limit at the same levels as the previous five-year period. Alternative 3B is the Agency's preferred alternative. Alternative 3B would authorize a maximum mortality of 82 bowheads in a single year, if the authorized carry-over of 15 unused strikes were to occur. The subsistence harvest is also subject to an overall limit of no more than 306 bowhead whales over the six-year period 2013 through 2018. This level of mortality is considered negligible in magnitude for the bowhead population, in light of current abundance and growth trends. The overall effects of human activities associated with subsistence whaling under Alternative 3B results in a minor impact rating for the Western Arctic bowhead whale stock.

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DRAFT

ENVIRONMENTAL IMPACT STATEMENT

FOR

ISSUING ANNUAL QUOTAS TO THE ALASKA ESKIMO WHALING COMMISSION FOR A SUBSISTENCE HUNT ON BOWHEAD WHALES FOR THE YEARS 2013 THROUGH 2017/2018

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

June 2012

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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
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
AWI	Animal Welfare Institute
Bcf	billion cubic feet
BOEM	Bureau of Ocean Energy Management
BOEMRE	Bureau of Ocean Energy Management, Regulation and Enforcement
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
COP	ConocoPhillips Company
CPAI	ConocoPhillips Alaska, Inc.
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
ft	feet
G&G	Geological and Geophysical
GTP	gas treatment plant
HCHs	hexachlorocyclohexanes
Hg	mercury
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
m	meters
mi.	miles
MHW	Mean High Water
MMC	Marine Mammal Commission
MMPA	Marine Mammal Protection Act
MMS	Minerals Management Service
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
ND	no data
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NMML	National Marine Mammal Laboratory
NPFMC	North Pacific Fishery Management Council
NOAA	National Oceanic and Atmospheric Administration
NRC	National Research Council
NSB	North Slope Borough
OCs	Organochlorines
OCS	Outer Continental Shelf
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
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
URS	URS Corporation
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
Y-K	Yukon-Kuskokwim

EXECUTIVE SUMMARY

ES.1 Description of the Proposed Action

The National Oceanic and Atmospheric Administration's (NOAA) National Marine Fisheries Service (NMFS) proposes to authorize subsistence harvests of the Western Arctic stock of bowhead whales for a five- or six-year period (depending on the alternative) commencing in 2013,[1] under the Whaling Convention Act (WCA), and a cooperative agreement with the Alaska Eskimo Whaling Commission (AEWC). Under the International Convention for the Regulation of Whaling (ICRW), the International Whaling Commission (IWC) approves overall 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. On an annual basis, NMFS can issue the AEWC the Alaskan share of this quota. The subsequent hunt is managed under the WCA, cooperatively by NMFS and the AEWC.

The purpose of this action is twofold: to manage the conservation and subsistence utilization of the Western Arctic stock of bowhead whales (as required under the Marine Mammal Protection Act [MMPA], the WCA, 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 will conduct its next meeting in June and July 2012 in Panama City, Panama, and based on the management advice of the IWC Scientific Committee, is likely to adopt a catch limit for 2013 through 2017 or 2018, at the same levels as the previous five-year period. It is possible that the IWC might not update the catch limit, notwithstanding IWC Scientific Committee management advice that the hunt is sustainable. If so, it should be noted that NOAA is considering issuing annual quotas for the time periods described in the Alternatives under the current IWC Schedule language. For additional information on the legal context and regulatory history of the proposed action, see Sections 1.1 and 1.2.

The proposed action continues implementation of the IWC subsistence catch limits that have been in effect since 1977. The IWC, NMFS, and the AEWC have cooperated in conserving and managing the subsistence harvest of bowhead whales for 30 years. The Western Arctic bowhead whale stock has been the subject of extensive research by scientists of NMFS and the North Slope Borough (NSB), so a considerable body of knowledge has been developed. In general, relatively few public and agency comments were received during the scoping period, and no major controversies were identified. For a summary of the comments, see Section 1.3. Among the issues raised in agency and public comments are the following:

- compliance with National Environmental Policy Act (NEPA) requirements, including the adequacy of the alternatives analyzed;
- the biological and social effects of subsistence whaling;

[1] The IWC 64 meeting in June/July 2012 will consider an amendment to extend the aboriginal subsistence whaling catch limits through 2018. If the amendment is not adopted, the IWC may extend the catch limits for five years instead (i.e., 2013 through 2017). These options are further defined in terms of the alternatives for analysis in Chapter 2.

- the analysis of cumulative effects from climate change and oil and gas exploration and development;
- the need for the proposed level of subsistence whaling allocations; and
- humane methods of take.

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

The Western Arctic bowhead whale is listed as "endangered" under the Endangered Species Act (ESA) and designated as "depleted" under the MMPA. However, the stock has been increasing in recent years. The current estimate of 10,545 whales is between 46% and 101% of the estimated pre-exploitation abundance (10,400-23,000). Some analyses suggest that the population may be approaching carrying capacity, though there is no sign of slowing in the population growth rate. The average annual level of human-caused mortality and serious injury is estimated to be 41 whales, which exceeds neither the Potential Biological Removal (PBR) level (95 whales), as discussed in Section 1.1.3 and Section 3.2 nor the IWC's annual catch limit (67 strikes per year, not to exceed 255 whales landed over a five-year period).

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 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 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 quota system under the authority of 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 Environmental Impact Statement (EIS) 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 EIS considers five alternatives for this proposed action. Additional information on the alternatives is found in Section 2.

Under the ICRW Schedule provisions, the limits on aboriginal subsistence whaling consist of two components. Since 1977, 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. In addition, no more than 67 bowhead whales may be struck per year, with provision for a carry-over of up to 15 unused strikes from one year to the subsequent year, as detailed below in Alternative 3A. The term "strike limit" is used to refer to this limitation on the number of whales that may be struck, and the term "unused strike" refers to an unused portion of the limit on the number of whales that may be struck. The strike limit is larger than the landed limit, to take into account whales that may be struck but not successfully landed.

For the four action alternatives (Alternative 2A, Alternative 2B, Alternative 3A and Alternative 3B), bowhead subsistence quotas are set annually by NMFS. 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 quota for the year.

ES.5 Alternative 1 (No Action): Do not grant the AEWC a quota.

Under this alternative, NMFS would not issue the AEWC a subsistence whaling quota for cultural and nutritional purposes. This could occur if NMFS chose not to issue an annual quota because of environmental concerns.

ES.6 Alternative 2A: Grant the AEWC an annual strike quota of 67 bowhead whales, not to exceed a total of 255 landed whales over the five years 2013 through 2017, with no unused strikes added to the annual quota.

Under this alternative, NMFS would grant the AEWC an annual strike quota of 67 bowhead whales, subject to a total of 255 landed whales over the five years 2013 through 2017. A 'strike' is defined as hitting a whale with a lance, harpoon, or explosive device while 'landing' means bringing a whale or any parts thereof onto the ice or land in the course of a whaling operation (50 Code of Federal Regulations [CFR] 230.2). The quota for 255 landed whales represents the United States (U.S.) portion of the total allocation of 280 landed whales granted by the IWC to aboriginal whalers. The actual allocation of strikes between Alaska Eskimos and Russian Chukotkan Natives is determined on an annual basis through a bilateral agreement between the U.S. and Russian governments. Under this alternative, no unused strikes from a previous year would be added to the quota for a subsequent year, notwithstanding the IWC's approval of a carry-over of unused strikes in the bowhead subsistence catch limits.

ES.7 Alternative 2B: Grant the AEWC an annual strike quota of 67 bowhead whales, not to exceed a total of 306 landed whales over six years 2013 through 2018 with no unused strikes added to the annual quota.

Under this alternative, NMFS would grant the AEWC an annual strike quota of 67 bowhead whales, subject to a total of 306 landed whales over the six years 2013 through 2018. The quota for 306 landed whales represents the U.S. portion of the total allocation of 336 landed whales granted by the IWC to aboriginal whalers. Under this alternative, no unused strikes from a previous year would be added to the catch limits for a subsequent year, notwithstanding the IWC's approval of a carry-over of unused strikes in the bowhead subsistence catch limits.

ES.8 Alternative 3A: Grant the AEWC an annual strike quota of 67 bowhead whales, not to exceed a total of 255 landed whales over the five years 2013 through 2017; with no more than 15 previously unused strikes from the previous year are added to the annual strike quota. This alternative would maintain the status quo for five years with respect to management of the hunt.

Under this alternative, NMFS would grant the AEWC an annual strike quota of 67 bowhead whales (plus carry-over), not to exceed a total of 255 landed whales over the five years 2013 through 2017. This alternative differs from Alternatives 2A and 2B, by allowing up to 15 unused strikes from a previous year to be added to the quota for a subsequent year, consistent with the IWC catch limit. The IWC schedule permits carry-over of 15 unused strikes. A carry-over allows for variability in hunting conditions from one year to the next within limits that conserve the Western Arctic bowhead stock.

ES.9 Alternative 3B (Preferred Alternative): Grant the AEWC an annual strike quota of 67 bowhead whales, not to exceed a total of 306 landed whales over the six years 2013 through 2018, with no more than 15 previously unused strikes from previous year are added to the annual strike quota. This alternative would maintain the status quo for six years with respect to management of the hunt.

Under this alternative (the proposed action), NMFS would grant the AEWC an annual strike quota of 67 bowhead whales (plus carry-over), not to exceed a total of 306 landed whales over the six years 2013 through 2018. This alternative differs from Alternatives 2A and 2B, by allowing up to 15 unused strikes from a previous year to be added to the quota for a subsequent year, consistent with the IWC catch limit. The IWC schedule permits carry-over of 15 unused strikes. A carry-over allows for variability in hunting conditions from one year to the next within limits that conserve the Western Arctic bowhead stock.

ES.10 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-over in some alternatives), rather than a quota for landed whales (which was 255 for the period 2008 through 2012). There are no definitive data on the fate of whales struck and not landed, also referred to as struck and lost. 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.

ES.10.1 Alternative 1: Direct and Indirect Effects on the Western Arctic Bowhead Whale Stock

Alternative 1 would eliminate a quota for subsistence taking of bowhead whales and might result in the elimination of subsistence whaling activities and harvest. No bowhead whales would be taken in subsistence harvests. Therefore, the magnitude, extent, and duration of direct mortality under this alternative are considered negligible to the population of bowheads (as per 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. Without the subsistence hunter the rate of growth in the bowhead population may increase from an estimated annual average of 3.2% (for the period 1984 through 2003) to an estimated 3.7%.

ES.10.2 Alternative 2A: Direct and Indirect Effects on the Western Arctic Bowhead Whale Stock

Alternative 2A would authorize a maximum annual mortality (or strikes) of 67 bowheads for a five-year period, subject to a total of 255 landed whales over five years. Over the five-year period the total mortality could be 5 x 67 or 335 whales. The total mortality would be lower if all struck whales were landed because of the limit on landed whales. The total annual mortality assessment under this alternative is 67 whales per year which, given the current abundance and growth trends (Section 3.2.1), is unlikely to cause the population to decline or to slow its rate of recovery. This maximum annual mortality of 67 bowhead whales would be 43% of the Q_{low} value of 155 whales per year, which is rate of harvest at which population growth may be impeded. The magnitude, geographic extent, and duration 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 2A 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. Disturbance to the whales from subsistence whaling activities under Alternative 2A would be localized and short-term and would be considered minor at the population level.

ES.10.3 Alternative 2B: Direct and Indirect Effects on the Western Arctic Bowhead Whale Stock

Alternative 2B would authorize a maximum annual mortality (or strikes) of 67 bowheads for a six year period, subject to a total of 306 landed whales over six years. The six-year total mortality (or strikes) could reach 6 x 67 or 402 whales. If all struck whales are landed, the total mortality would be lower due to the limit on the number of whales landed. The direct and indirect effects of Alternative 2B on the bowhead whale population would be nearly identical to Alternative 2A since the annual strike quota remains the same, but would extend for one additional year through 2018. The magnitude, geographic extent, and duration of this level of mortality are considered negligible for the bowhead population, and disturbance to the whales from subsistence whaling activities under Alternative 2B would be localized and short-term and considered minor at the population level.

ES.10.4 Alternative 3A: Direct and Indirect Effects on the Western Arctic Bowhead Whale Stock

Alternative 3A would authorize a maximum mortality (strikes) of up to 82 bowheads in a year, if the authorized carry-over of 15 unused strikes were to occur, subject to a total of 255 landed whales over five years. Over the five-year period the total mortality could be 350 whales (5 x 67, plus 15 carried over) or an average of 70 bowhead whales per year. This maximum annual mortality of 82 bowhead whales would be 56% of the Q_{low} value of 155 whales per year, which is rate of harvest at which population growth may be impeded. 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 2A, so the overall impact is rated negligible. The effects of human activities associated with subsistence whaling under Alternative 3A would be similar to those described for Alternative 2A, with disturbance at a minor impact level.

ES.10.5 Alternative 3B: Direct and Indirect Effects on the Western Arctic Bowhead Whale Stock

Alternative 3B would authorize a maximum mortality (strikes) of up to 82 bowheads in a given year, if the authorized carry-over of 15 unused strikes were to occur, subject to a total of 306 landed whales over six years. Over the six-year period the total mortality could be 417 whales (6 x 67, plus 15 carried over) or an average of 70 bowhead whales per year. The direct and indirect effects of Alternative 3B on the bowhead whale population would be nearly identical to Alternative 3A; the annual strike quota remains the same, but would extend for one additional year through 2018. The overall impact of Alternative 3B is, therefore, considered negligible at the population level. The disturbance effects of human activities associated with subsistence whaling under Alternative 3B would be considered minor.

ES.10.6 Effects of the Alternatives on Individual Whales

In addition to the effects of harvest on the Western Arctic bowhead whale stock, there are indirect disturbance effects on individual bowhead whales, not subject to the harvest. These impacts will be negligible in magnitude, extent, and duration under Alternative 1, since under this alternative no subsistence whaling would occur. Under Alternatives 2A, 2B, 3A, and 3B, subsistence whaling would occur, and as described in the effects analysis in Section 4.4, the magnitude, extent and duration of the associated disturbance effects would be minor for the individual bowhead whales not subject to harvest. For additional information on the effects of the alternatives on individual whales, see Section 4.5.

ES.10.7 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, localized effects in terms of mortality. 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 primarily dispersed, like seals and polar bears, few animals would be disturbed and the effects would be considered minor. Alternatives 2A, 2B, 3A, and 3B would have no more than negligible or minor effects on other wildlife species. For additional information see Section 4.7.

ES.10.8 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 Eskimos and, possibly, to Native Americans in general. Alternatives 2A, 2B, 3A, and 4B, 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.10.9 Cumulative Effects of the Alternatives

This EIS 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 routine activities under any of the action alternatives, when ongoing mitigation measures are taken into consideration, would result in major adverse impacts on the bowhead whale population.

None of the alternatives, when combined with other reasonably foreseeable activities, would result in major adverse effects on other wildlife species (Section 4.7). 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 are taken into consideration (Section 4.8).

However, a Very Large Oil Spill (VLOS) could have major adverse effects. 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 impact of a VLOS on bowhead whales could be state-wide, given the migratory nature of bowhead whales.

The following tables reproduced from Chapter 4 of this EIS 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

Effect Type	Alternative 1 No Action: Do Not Grant AEWC a Quota	Alternative 2A Grant AEWC Annual Quotas (67 Strikes) for 5 years with No Unused Strikes Carried Over	Alternative 2B Grant AEWC Annual Quotas (67 Strikes) for 6 years with No Unused Strikes Carried Over	Alternative 3A Grant AEWC Annual Quotas (67 Strikes) for 5 years with No More Than 15 Unused Strikes Carried Over Any One Year	Alternative 3B (Preferred Alternative) Grant AEWC Annual Quotas (67 Strikes) for 6 years with No More Than 15 Unused Strikes Carried Over Any One Year
Direct and Indirect Effects on Whale Population – Mortality (Section 4.4)	No Impact	Negligible	Negligible	Negligible	Negligible
Direct and Indirect Effects Whale Population - Disturbance (Section 4.4)	No Impact	Minor Adverse	Minor Adverse	Minor Adverse	Minor Adverse
Direct and Indirect Effects on Individual Whales (Section 4.5)	No Impact	Disturbance - Minor Adverse	Disturbance - Minor Adverse	Disturbance - Minor Adverse	Disturbance - Minor Adverse
Cumulative Effects on Whale Stock (Section 4.6)	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 (Section 4.7)	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 (Section 4.8.1)	Major Adverse	Major Beneficial	Major Beneficial	Major Beneficial	Major Beneficial
Effects on Health (Section 4.8.2)	Major Adverse	Major Beneficial	Major Beneficial	Major Beneficial	Major Beneficial
Effects on Public Safety (Section 4.8.2)	Minor Beneficial	Minor Adverse	Minor Adverse	Minor Adverse	Minor Adverse
Effects on Other Tribes (Section 4.8.3)	Moderate Adverse to Major Adverse	Negligible	Negligible	Negligible	Negligible
Effects on the General Public (Section 4.8.4)	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 Adverse Pro-indigenous rights public – Minor Beneficial
Effects on Environmental Justice (Section 4.8.5)	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 on Bowhead Whales

Effect		Alternative 1 No Action: Do Not Grant AEWC a Quota	Alternative 2A Grant AEWC Annual Quotas (67 Strikes) for 5 years with No Unused Strikes Carried Over	Alternative 2B Grant AEWC Annual Quotas (67 Strikes) for 6 years with No Unused Strikes Carried Over	Alternative 3A Grant AEWC Annual Quotas (67 Strikes) for 5 years with No More Than 15 Unused Strikes Carried Over Any One Year	Alternative 3B (Preferred Alternative) Grant AEWC Annual Quotas (67 Strikes) for 6 years with No More Than 15 Unused Strikes Carried Over Any One Year
Direct and Indirect Effects	Mortality	No impact.	Negligible impact to bowhead whale populations.	Bowhead whales – (Same as Alternative 2A)	Bowhead whales – (Same as Alternative 2A)	Bowhead whales – (Same as Alternative 2A)
	Disturbance	No impact.	Impacts of noise and disturbance under this alternative would be minor in magnitude, extent, and duration.	Bowhead whales – (Same as Alternative 2A)	Bowhead whales – (Same as Alternative 2A)	Bowhead whales – (Same as Alternative 2A)
Cumulative Effects		No direct or indirect impacts of alternative. Cumulative effects to mortality would be negligible in magnitude, extent, and duration. Cumulative effects to disturbance would be minor in magnitude, extent and duration. A very large oil spill is a low probability event, but could have major effects if the spill occurred during a time when bowheads were present. Alternative 1 would not contribute to mortality or disturbance.	Direct and indirect effects of alternative two would have negligible impacts on mortality and disturbance of bowheads. Cumulative effects to mortality would be negligible in magnitude, extent, and duration. Cumulative effects to disturbance would be minor in magnitude, extent, and duration, at the population level. A very large oil spill is a low probability event, but could have major effects if the spill occurred during a time when bowheads were present. Alternative 2 would make a minor contribution to cumulative levels of mortality and a minor to moderate contribution to cumulative effects of disturbance.	Bowhead whales – (Same as Alternative 2A)	Bowhead whales – (Same as Alternative 2A)	Bowhead whales – (Same as Alternative 2A)

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Table ES-3
Summary of Direct, Indirect, and Cumulative Effects – Other Wildlife

Effect		Alternative 1 No Action: Do Not Grant AEWC a Quota	Alternative 2A Grant AEWC Annual Quotas (67 Strikes) for 5 years with No Unused Strikes Carried Over	Alternative 2B Grant AEWC Annual Quotas (67 Strikes) for 6 years with No Unused Strikes Carried Over	Alternative 3A Grant AEWC Annual Quotas (67 Strikes) for 5 years with No More Than 15 Unused Strikes Carried Over Any One Year	Alternative 3B (Preferred Alternative) Grant AEWC Annual Quotas (67 Strikes) for 6 years with No More Than 15 Unused Strikes Carried Over Any One Year
Direct and Indirect Effects	Mortality	Direct and indirect effects on mortality would be minor to moderate in magnitude, extent, and duration.	This alternative would have negligible to minor direct and indirect effects on mortality.	Same as Alternative 2A	Same as Alternative 2A	Same as Alternative 2A
	Disturbance	Direct and indirect effects on disturbance would be minor to moderate in magnitude, extent, and duration.	This alternative would have negligible to minor direct and indirect effects on disturbance.	Same as Alternative 2A	Same as Alternative 2A	Same as Alternative 2A
Cumulative Effects		The contribution of Alternative 1 to cumulative effects would be moderate for important game species (e.g., caribou) and minor for other species.	The contribution of Alternative 2 to cumulative effects would be negligible.	Same as Alternative 2A	Same as Alternative 2A	Same as Alternative 2A

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Table ES-4
Summary of Direct, Indirect, and Cumulative Effects – Socio-cultural Environment

Effect		Alternative 1 No Action: Do Not Grant AEWC a Quota	Alternative 2A Grant AEWC Annual Quotas (67 Strikes) for 5 years with No Unused Strikes Carried Over	Alternative 2B Grant AEWC Annual Quotas (67 Strikes) for 6 years with No Unused Strikes Carried Over	Alternative 3A Grant AEWC Annual Quotas (67 Strikes) for 5 years with No More Than 15 Unused Strikes Carried Over Any One Year	Alternative 3B (Preferred Alternative) Grant AEWC Annual Quotas (67 Strikes) for 6 years with No More Than 15 Unused Strikes Carried Over Any One Year
Direct and Indirect Effects	Effects on Subsistence	Direct and indirect effects on subsistence are adverse, and would be major in magnitude and extent, but of unknown duration.	Direct and indirect effects on subsistence are positive and would be major in magnitude, extent, and duration.	Same as Alternative 2A	Same as Alternative 2A	Same as Alternative 2A
	Effects on public health and safety	Direct and indirect effects on public health are adverse, and would be major in magnitude and extent, but of unknown duration. The effects on safety would be minor.	Direct and indirect effects on public health and safety are positive and would be major in magnitude, extent, and duration.	Same as Alternative 2A	Substantially similar to Alternative 2A; however, the ability to carry over unused strikes would result in greater temporal flexibility in subsistence effort and beneficial effects to public safety.	Substantially similar to Alternative 2A; however, the ability to carry over unused strikes would result in greater temporal flexibility in subsistence effort and beneficial effects to public safety.
Cumulative Effects		The contribution of Alternative 1 to cumulative effects on subsistence practices and nutrition and health would be adverse and major in magnitude, extent, and duration. This alternative makes a minor contribution to the cumulative effects on public safety.	The contribution of Alternative 2 to cumulative effects on subsistence harvest practices would be beneficial and major in magnitude, extent, and duration. Overall cumulative effects on subsistence harvest practices would be adverse and minor to moderate depending upon the timing and location of oil and gas activities and the efficacy of measures intended to mitigate such 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 of the subsistence bowhead whaling allocation.	Same as Alternative 2A	Same as Alternative 2A	Same as Alternative 2A

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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 quotas to the Alaska Eskimo Whaling Commission (AEWC) to allow continuation of its subsistence hunt for bowhead whales from the Western Arctic stock[2] for a five- or six- year period commencing in 2013.[3] 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 the fullest extent possible consistent with applicable law, 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 USC 4321 et seq.), considers five alternatives for issuing the AEWC a share of catch limits approved by the International Whaling Commission (IWC). The proposed action would comply with NMFS's responsibilities under Section 101(b) of the Marine Mammal Protection Act (MMPA) and under the Whaling Convention Act (WCA).

1.1.2 Location of Action

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

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 stock abundance has been increasing in recent

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

[3] The IWC 64 meeting in June/July 2012 will consider an amendment to extend the aboriginal subsistence whaling catch limits through 2018. If the amendment is not adopted, the IWC may extend the catch limits for five years instead (i.e., 2013 through 2017). These options are further defined in terms of the alternatives for analysis in Chapter 2.

years; the current estimate of 10,545 is between 46% and 101% of the pre-exploitation abundance estimated at 10,400-23,000 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).

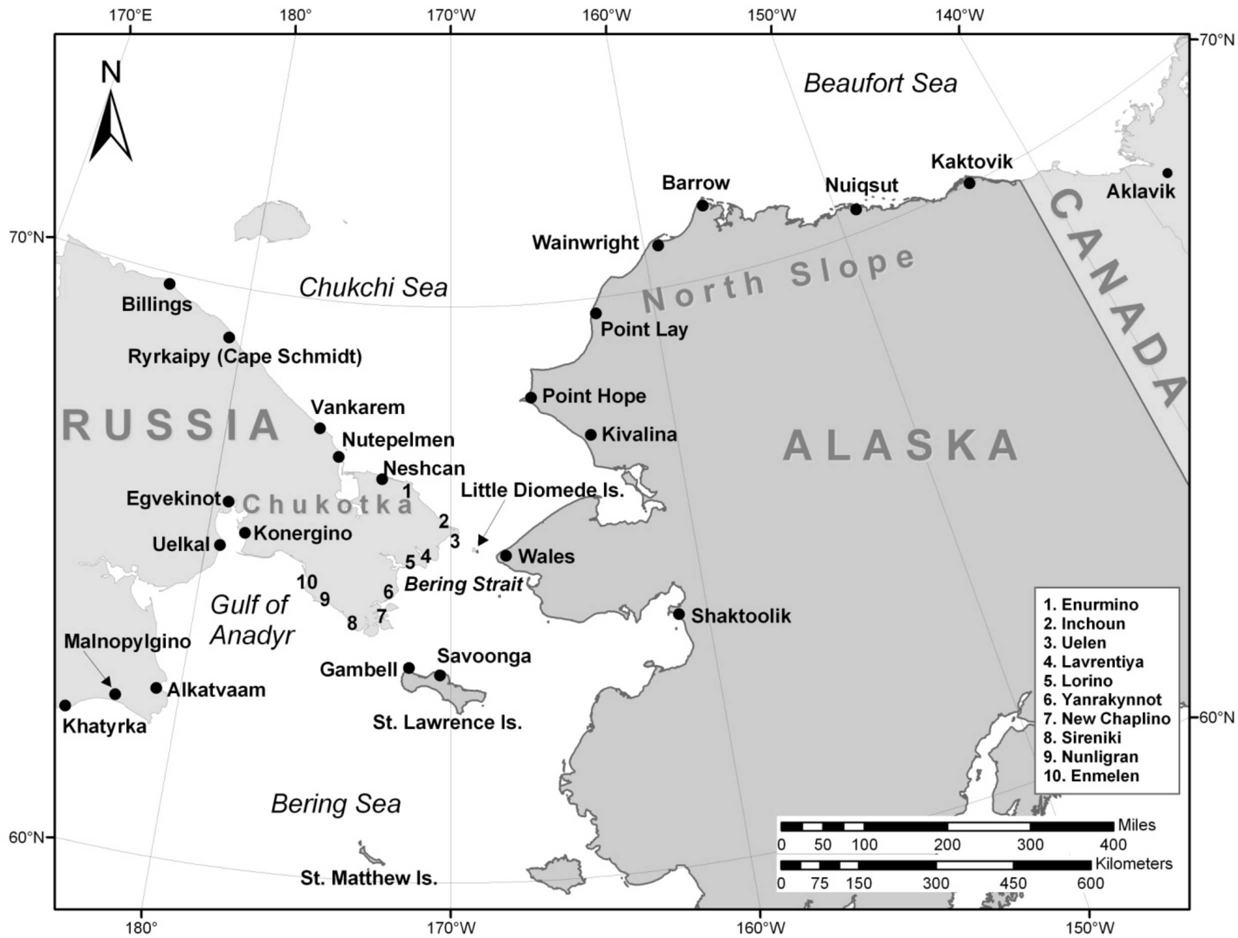

Figure 1.1.2-1 Historic and Current Bowhead Whaling Villages in Alaska, Canada, and Russia.

The estimated annual mortality rate incidental to commercial fisheries (0.2 whales per year) is not known to exceed 10% of the potential biological removal (PBR) for the stock. PBR for the Western Arctic bowhead stock is 95 therefore, 10% of PBR is 9.5 animals, below which mortality can be considered insignificant. The average annual level of intentional human-caused mortality and serious injury (41 whales) is not known to exceed the PBR or the IWC annual strike limit (67 whales) (Angliss and Outlaw, 2005). 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.

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 United

States (U.S.)-Canada border to Barrow, Alaska should be considered critical habitat. On May 22, 2001, NMFS found the petition to have merit and initiated a formal review (66 Federal Register [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 Eskimo Tradition of Subsistence Hunt of Bowhead Whales

Iñupiat and Siberian Yupik Eskimos have hunted bowhead whales for over 2,000 years (Stoker and Krupnik, 1993). Hunting bowhead whales in Alaska remains a communal activity that supplies important meat and *maktak*[4] for the entire community, as well as for feasts and during annual celebrations. 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, and for their stewardship of traditions of sharing and distributing *maktak* throughout the community. 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. 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).

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 (Figure 1.1.2-1) take less than 1% of the stock of bowhead whales per year (Philo et al., 1993). After 1977, the number of whales landed ranged between 8 and 55 per year and whales struck and lost ranged from 5 to 28 per year (AEWC and NSB, 2010).

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 quotas under the 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

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

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 U.S. 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 Constitutional provide the basis for legislation, treaties, and Executive Orders (EOs) 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, so as 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 policy-making 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 that was 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 U.S. was an original signatory to the ICRW in

1946. A main focus of the ICRW was the establishment of the IWC. 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 is 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 (Article V.1) for whale stocks. 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 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 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. Aboriginal provisions were incorporated into predecessor treaties to the ICRW and have been a part of the whaling regime under the ICRW since the time of the first Schedule (note that 'aborigines' refers to indigenous groups for purposes of this EIS). The IWC governs aboriginal whaling internationally by setting overall catch limits on 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 (i.e., they submit a needs statement). At the 1994 Annual 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.

Since 1997, the IWC has set catch limits for aboriginal subsistence whaling generally in five-year increments, subject to annual review. These catch limits are contained in paragraph 13 of the Schedule. Catch limits for Western Arctic bowhead whales have been expressed in two components: a limit on the number of whales landed, and a slightly higher limit on the number of whales that may be struck. The term "strike limit" 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 and ensures an upper limit on total strikes for conservation management. The WCA defines aboriginal subsistence whaling as whaling authorized by paragraph 13 of the Schedule annexed to and constituting a part of the ICRW (50 Code of Federal Regulations [CFR] 230.2). Aboriginal subsistence whaling is not otherwise defined in the Schedule, but the following definition of subsistence use was adopted by consensus at the 2004 Annual Meeting of the IWC:

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 tra[d]e, but the predominant portion of the products from each whale 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 shall be established according to certain management principles. Paragraph 13(a) of the current Schedule also includes the prohibition on the "strik[ing], tak[ing] or kill[ing] calves or any whale accompanied by a calf," applicable to Western Arctic bowhead whales, and the requirement that "all aboriginal whaling shall be conducted under national legislation that accords with paragraph 13 of the Schedule" (IWC 2005a:13(a)(4)&(5)). Paragraph 13(b) of the current Schedule provides that subsistence whaling of Western Arctic bowhead whales is permitted, subject to certain conditions, and then describes catch limits through 2012. (IWC 2005a:13(b)(1)). Native peoples engaging in subsistence hunts do so under permit issued by their governments. In the case of Alaska Eskimo and Russian Native subsistence hunts, the U.S. 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 (see Appendix 8.1 for the

2012 statement of subsistence and cultural needs). Once the IWC sets catch limits for each whale stock, the WCA provides the mechanism for the U.S. to implement these catch limits and other applicable Schedule requirements. To date, the IWC has generally set catch limits in five-year increments. The Commission may approve a change to six-year increments at the IWC64 meeting in June - July 2012. It is possible that the IWC might not update the catch limit, notwithstanding IWC Scientific Committee management advice that the hunt is sustainable. If so, it should be noted that NOAA is considering issuing annual quotas for the time periods described in the Alternatives under the current IWC Schedule language.

1.2.3 Whaling Convention Act

The Whaling Convention Act of 1949 (WCA) was enacted to implement the domestic obligations of the U.S. government under the ICRW. IWC Schedule provisions to which the U.S. has not objected shall become effective with respect to all persons and vessels subject to the jurisdiction of the U.S. in accordance with the terms of the Schedule provisions and Article V of the ICRW (WCA § 916k). 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 U.S. as a Contracting Government.

The Secretary of Commerce holds general powers, which have been delegated to NMFS, to administer and enforce whaling[5] in the U.S., including issuance of necessary regulations to carry out that authority (WCA §§ 916d, 916k). The regulations (located at 50 CFR Part 230) prohibit whaling, except for aboriginal subsistence whaling authorized by the IWC (50 CFR 230.1). NMFS publishes aboriginal whaling quotas set in accordance with paragraph 13 of the Schedule in the FR, 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)). Issuance of the quota is contingent upon agency completion of a NEPA review. Any quotas issued are allocated to each whaling village or tribal whaling captain by the appropriate Native American whaling organization.

The WCA regulations track the ICRW 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) (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)).

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

[5] Under Section 102(f) of the MMPA, commercial whaling is expressly banned in waters subject to the jurisdiction of the United States.

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 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 the bowhead quota, these provisions are also laid out in the Cooperative Agreement between NOAA and the AEWC (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 Eskimos' subsistence hunt of bowhead whales. The purposes of the AEWC are to ensure that the hunting is conducted in a traditional, non-wasteful manner; to communicate to the outside world the cultural significance of bowhead whaling for the North Slope Iñupiat and St. Lawrence Island Yupik; and to promote scientific research on bowhead whales to ensure their continued existence without unnecessary disruption to the whaling communities. During the initial years of controversy, the AEWC adopted its first Management Plan (May 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, the foundations for cooperation between NOAA and AEWC were established, and this framework has endured to the present. The AEWC also agreed to cooperate with the U.S. in scientific research efforts and to develop a management plan to be followed by all bowhead whale subsistence hunters to help improve the efficiency of the subsistence hunt.

NOAA and the AEWC have agreed to work together through a Cooperative Agreement, but they bring different sources of authority to the cooperative effort. 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 captains and their crew members 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 captains in each community. The crew members 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, 1982 and as amended and restated October 14, 1992). Federal authority for bowhead management is governed by the WCA. Management of the Eskimo subsistence bowhead whale hunt is shared through the Cooperative Agreement between the AEWC and NOAA (Appendix 8.2). (Note that NMFS serves as the representative of NOAA, its parent agency, in the administration of subsistence whaling in Alaska).

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

- protect the Western Arctic population of bowhead whale 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. The agreement also provides for an exclusive enforcement mechanism applied to any violation by the registered member whaling captains or their crews. For actions of AEWC members as they relate to aboriginal subsistence bowhead hunts, the AEWC is the first line of enforcement for the MMPA, the ESA, the WCA, the ICRW and its Schedule, the AEWC management plan; or the agreement itself (Appendix 8.2 and Chapter 3 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).

Although the AEWC, the IWC, and NOAA initially had significantly different perspectives on the population status of the bowhead population, the rise of cooperative management in this case is highly distinctive in the degree to which the AEWC and the 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. The AEWC members felt this research vindicated their traditional knowledge perspective that the bowhead population was much larger than the alarming estimates of the late 1970s.

1.2.5 Marine Mammal Protection Act and Endangered Species Act

The 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 United States Code [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 allows the take of marine mammals by Alaska Natives for subsistence purposes, provided that such activities are not accomplished in a wasteful manner (16 U.S.C. 1371(b)). Inedible by-products such as baleen, bone, and ivory may be fabricated into Native handicrafts for sale, under these regulations. 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 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 National Environmental Policy Act

The 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 quota allocations to AEWC (NMFS, 2003).

For the 2008 through 2012 quota block, NMFS decided to prepare an EIS rather than an EA (NMFS 2008). This decision was 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 EIS 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 EIS 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 the five-year quota block for 2013 through 2017 or 2018, NMFS has again decided to prepare an EIS, but with a longer timeframe for analysis. The last decade has shown that the bowhead population continues to grow at a modest rate and that subsistence harvests are stable and do not adversely affect the bowhead populations. As a result, NMFS proposed that the current EIS should estimate environmental effects for a 25 or 30 year period, recognizing that every five or six years, when new catch limits are considered by the IWC, 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.

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 three 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 – 2012 (NMFS, 2008). 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 September 22, 2011, NMFS issued a Notice of Intent to prepare an EIS for issuing a bowhead whale subsistence quota to the AEWC for the years 2013 through 2017 (76 FR 58781). NMFS requested comments on the proposed issuance of annual quota over a five-year period, requested information on the affected environment, and requested comments on the issues to be analyzed in the document. NMFS also sent a public news release to local Alaska newspapers and statewide public radio. In addition, NMFS sent letters to all federally recognized tribal governments located in the affected geographic area, soliciting their comments. Comments from the public were accepted through October 31, 2011.

During the scoping period, a total of six scoping comment submissions were received: three from the general public; one from the non-governmental organization, the Animal Welfare Institute (AWI) on behalf of itself and the Whale and Dolphin Conservation Society; and two from federal agencies, including the Environmental Protection Agency (EPA) and the Marine Mammal Commission (MMC).

The NMFS allocation of a bowhead whale subsistence harvest quota is a recurring action of over two decades' standing. 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 EIS. The following paragraphs summarize these comments, drawing attention to those that augmented the issues already identified for analysis by NMFS.

The scoping comments from the general public included one concerning the subsistence need for subsistence bowhead whaling, stating that NMFS should determine the subsistence need of each village, considering whether waste of stored bowhead *maktak* indicates that need estimates have been too high. Section 3.5 describes the Alaska Eskimo subsistence uses of bowhead whales and the history of the IWC determinations of the subsistence and cultural need for bowhead whales (See also Appendix 8.1).

The scoping comments from AWI (and the Whale and Dolphin Conservation Society) included NEPA procedural concerns and a variety of topics for analysis in the EIS, with emphasis on the importance of a comprehensive and objective cumulative impact analysis. AWI requested up-to-date scientific evidence about the ecology, biology, and behaviors of the bowhead whale. AWI also requested a disclosure of the level of federal funding allocated to the AEWC and the whaling villages for the past twenty years, and how these funds were used. Finally in regard to harvest methods and techniques, AWI suggested discussion on the likely fate of struck whales not landed, and data that shows struck/loss rate over time; a description of both the fall and spring bowhead hunts for each community, including analysis of hunting efficacy as measured in time to death data; and descriptions of use, sharing, and storage practices, with clarification of Iñupiat cultural perspectives (i.e., code of conduct) governing treatment of the whale.

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 chapters 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 (See Suydam et al., 2011 for an account of the 2010 season), 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 mean time to death are described in Section 3.5.1. Iñupiat cultural perspectives on bowhead whaling are described in Section 3.5 Eskimo Tradition of Subsistence Hunt of Bowhead Whales.

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 Eskimo Tradition of Subsistence Hunt of Bowhead Whales.

The MMC recommended that intermediate alternatives be considered in the EIS due to the possibility that the IWC may adopt lower strike limits. MMC also suggested looking at harvest efficiency and efforts being made to reduce the number of struck and lost whales, including review of new harpoon technology and other measures that might be adopted to maximize the efficiency of subsistence whaling.

NMFS considered but decided not to analyze a lower strike limit alternative. Given the bowhead population status, the documented subsistence and cultural need, and the historical precedent of IWC allocations, NMFS considered it unlikely that IWC would adopt a lower strike limit. As noted in the MMC comments, the 2010 harvest saw a decline in harvest efficiency (i.e., the number of whales landed compared to the number of whales struck). Section 3.5.2 describes the factors leading to improved harvest efficiency since the mid-1970s, and the unusual conditions that contributed to lower efficiency in 2010.

1.3.3 Public Review of the Draft EIS

Accompanying this draft document is a letter describing the public review schedule and ways of submitting comments to NMFS during the review period.

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2.0 ALTERNATIVES, INCLUDING THE PROPOSED ACTION

Under the Whaling Convention Act (WCA), the National Marine Fisheries Service (NMFS) can issue an annual bowhead whale quota based on International Whaling Commission (IWC) Schedule provisions pertaining to the aboriginal subsistence harvest of Western Arctic bowhead whales. The subsequent hunt is managed cooperatively by NMFS and the Alaska Eskimo Whaling Commission (AEWC).

2.1 Alternative 1 (No Action): Do not grant the AEWC a quota

Under this alternative, NMFS would not issue the AEWC a subsistence whaling quota for cultural and nutritional purposes. This could occur if NMFS chose not to issue an annual quota based on environmental concerns.

2.2 Alternative 2A: Grant the AEWC an annual strike quota of 67 bowhead whales, not to exceed a total of 255 landed whales over five years 2013 through 2017 with no unused strikes added to the annual quota.

Under this alternative, NMFS would grant the AEWC an annual strike quota of 67 bowhead whales, subject to a total of 255 landed whales over the five years 2013 through 2017. The quota for 255 landed whales represents the U.S. portion of the total allocation of 280 landed whales granted by the IWC to aboriginal whalers. The actual allocation of strikes between Alaska Eskimos and Russian Chukotkan Natives is determined on an annual basis through a bilateral agreement between the United States (U.S.) and Russian Governments (Appendix 8.3).[6] Under this alternative, no unused strikes from a previous year would be added to the quota for a subsequent year, notwithstanding the IWC's approval of a carry-over of unused strikes in the bowhead subsistence catch limits.

2.3 Alternative 2B: Grant the AEWC an annual strike quota of 67 bowhead whales, not to exceed a total of 306 landed whales over six years 2013 through 2018 with no unused strikes added to the annual quota.

Under this alternative, NMFS would grant the AEWC an annual strike quota of 67 bowhead whales, subject to a total of 306 landed whales over the six years 2013 through 2018. The quota for 306 landed whales represents the U.S. portion of the total allocation of 336 landed whales granted by the IWC to aboriginal whalers. Under this alternative, no unused strikes from a previous year would be added to the catch limits for a subsequent year, notwithstanding the IWC's approval of a carry-over of unused strikes in the bowhead subsistence catch limits.

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[6] The current agreement was signed in 2008. It is expected that following the actions of the July 2012 IWC meeting in renewing the bowhead aboriginal subsistence harvest allocation, the U.S. and the Russian Federation will sign a new agreement in spring 2013.

2.4 Alternative 3A: Grant the AEWC an annual strike quota of 67 bowhead whales, not to exceed a total of 255 landed whales over the five years 2013 through 2017, with no more than 15 previously unused strikes from the previous year are added to the annual strike quota. This alternative would maintain the *status quo* for five years with respect to management of the hunt.

Under this alternative, NMFS would grant the AEWC an annual strike quota of 67 bowhead whales (plus carry-over), not to exceed a total of 255 landed whales over the five years 2013 through 2017. This alternative differs from Alternatives 2A and 2B, by allowing up to 15 unused strikes from a previous year to be added to the catch limits for a subsequent year, consistent with the IWC catch limit. A policy to permit carry-over of 15 unused strikes was approved by the IWC. A carry-over allows for variability in hunting conditions from one year to the next within limits that conserve the Western Arctic bowhead stock.

2.5 Alternative 3B (Preferred Alternative): Grant the AEWC an annual strike quota of 67 bowhead whales, not to exceed a total of 306 landed whales over the six years 2013 through 2018, with no more than 15 previously unused strikes from previous year are added to the annual strike quota. This alternative would maintain the *status quo* for six years with respect to management of the hunt.

Under this alternative (the proposed action), NMFS would grant the AEWC an annual strike quota of 67 bowhead whales (plus carry-over), not to exceed a total of 306 landed whales over the six years 2013 through 2018. This alternative differs from Alternatives 2A and 2B, by allowing up to 15 unused strikes from a previous year to be added to the catch limits for a subsequent year, consistent with the IWC catch limit. A policy to permit carry-over of 15 unused strikes was approved by the IWC. A carry-over allows for variability in hunting conditions from one year to the next within limits that conserve the Western Arctic bowhead stock.

2.6 Alternatives Considered but Not Carried Forward

Alternatives considered but discarded included alternatives that both substantially decreased and increased the annual and five year or six year bowhead whale subsistence quotas for Alaska Eskimos. A substantially decreased quota would not meet Alaska Eskimo's documented need for bowhead subsistence foods. A substantially increased quota may exceed Eskimo subsistence needs and has not been requested. One option under Alternative 1 would be to compensate the AEWC for not exercising its subsistence rights. While it may be appropriate for the AEWC to receive 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 Eskimos. 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 Eskimos and no bowhead whales would be taken. Therefore, Alternative 1 is identified as the environmentally preferred alternative based on impacts to bowhead whales. See *Section 4 Environmental Consequences* for a full analysis of predicted impacts of this alternative on the complete human environment.

2.8 Preliminary Preferred Alternative

For the purposes of public review of this Draft EIS the agency has identified Alternative 3B as its preliminary preferred alternative because it meets the purpose and need of this action; it achieves the socio-cultural benefits of the subsistence hunt at minimal environmental cost; and it keeps the harvest level and strike limit at current levels. During the upcoming June-July 2012 meeting of the IWC in Panama City, Panama, the IWC will act on the management advice of the IWC Scientific Committee and adopt a catch limit. NMFS will consider the action of the IWC and make a final determination on the preferred alternative to include in the Final EIS. It is possible that the IWC might not update the catch limit, notwithstanding IWC Scientific Committee management advice that the hunt the hunt is sustainable. If so, it should be noted that NOAA is considering issuing annual quotas for the time periods described in the Alternatives under the current IWC Schedule language.

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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). For management purposes, four bowhead whale stocks are currently recognized by the International Whaling Commission (IWC) (IWC, 2010a). These stocks occur in the Okhotsk Sea (Russian waters), Davis Strait and Hudson Bay (western Greenland and eastern Canadian waters), in the eastern North Atlantic (the Spitsbergen stock near Svalbard) and in the Bering-Chukchi-Beaufort seas (Figure 3.2-1). The latter is the Western Arctic stock, the largest remnant population and only stock found within United States (U.S.) waters (Rugh et al., 2003).

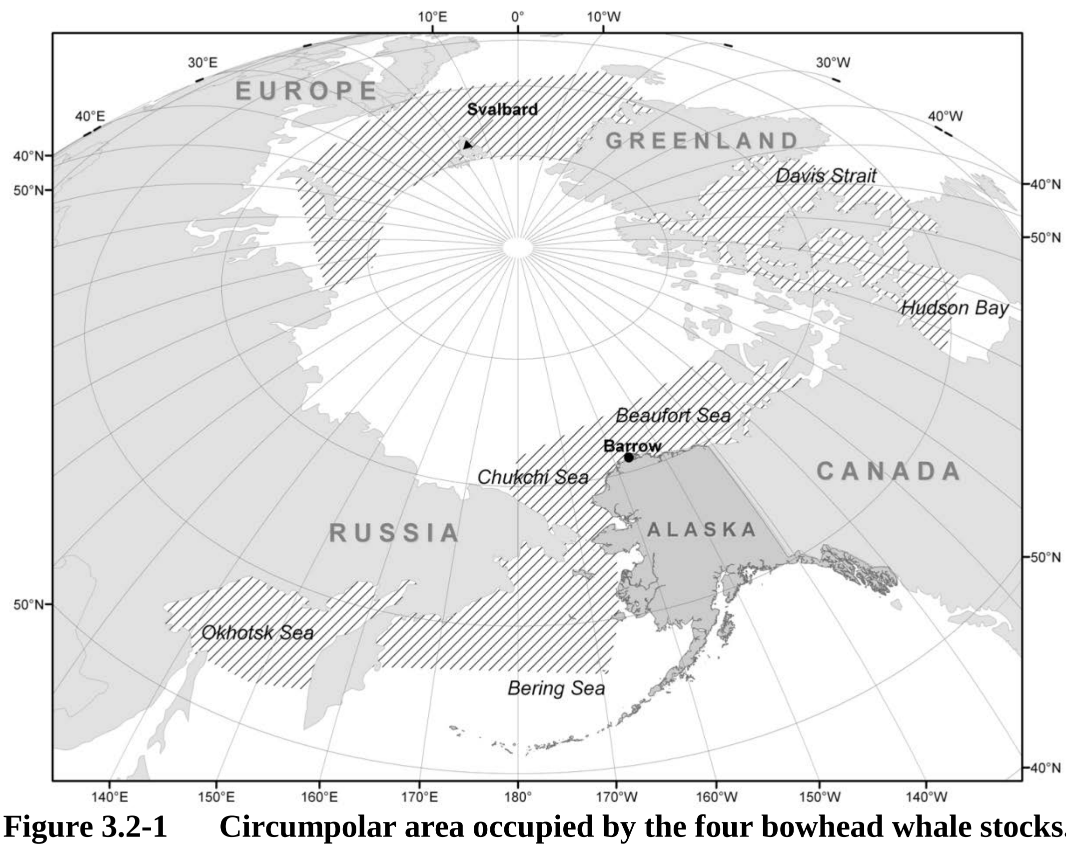

Figure 3.2-1 Circumpolar area occupied by the four bowhead whale stocks.

3.2.1 Current Abundance, Trends, Genetics, and Status

Abundance and Trends. All stocks of bowhead whales were severely depleted during intense commercial whaling prior to the 20th century, and most of these stocks have not shown significant evidence of recovery even though a century has passed since commercial whaling stopped (Woodby and Botkin, 1993). Only the Western Arctic stock has 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 Eskimo 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). The 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). These counts continue to be the primary source of abundance information for this stock (George et al., 2004a).

Recent ice-based counts occurred from April 5, to June 7, 2001 near Barrow, Alaska (George et al., 2004a). Observers recorded 3,295 unique individuals and an additional 532 whales that may have been observed before during the 1,130 hours of watch effort. This count included 121 calves (3.7% of the unique whales). Passive acoustic surveillance was conducted almost continuously from April 16 to May 31, 2001 resulting in 27,023 locations of vocalizing bowhead whales. The estimated number of whales within 4 kilometers (km) of the perch (N[4]) was 9,025 (Standard Error [SE] = 1,068). The estimated proportion of the whales within 4 km of the perch (P[4]) was 0.862 (SE = 0.044, computed by a moving blocks bootstrap). Combining these, the abundance estimate (N[4]/P[4]) for 2001 was 10,470 (SE = 1,351) with a 95% Confidence Interval (CI) of 8,100-13,500. The estimated annual rate of increase (ROI) of the population from 1978 to 2001 was 3.4% (95% CI 1.7%-5%) (Figure 3.2.1-1). Attempts to count migrating bowhead whales near Point Barrow in the spring of 2009 and 2010 were unsuccessful due to sea ice conditions, resulting in no new estimates of abundance (IWC, 2010b; George et al., 2011). Counts from the spring census and aerial photo-identification surveys conducted in 2011 are currently undergoing review.

Zeh and Punt (2004) reviewed and revised abundance estimates from 1978 to 2001 (Angliss and Outlaw, 2007: Table 41) increasing the 2001 estimate slightly from 10,470 to 10,545 bowhead whales. The current estimate of 10,545 (Zeh and Punt, 2004) is between 46% and 101% of the 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).

Sight-resight analyses of photographs of bowhead whales obtained during aerial surveys provided an estimate of 8,250 whales (95% CI: 3,150 to 15,450) in 2001 (Schweder et al., 2009) and 12,631 whales (95% CI: 7,900 to 19,700) in 2004 (Koski et al., 2010). Schweder et al. (2009) estimated a yearly growth rate of 3.2% between 1984 and 2003 based on these data. Although some analyses suggest the population may be approaching carrying capacity (K), there is no sign of slowing in the population growth rate (Brandon and Wade, 2006).

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).

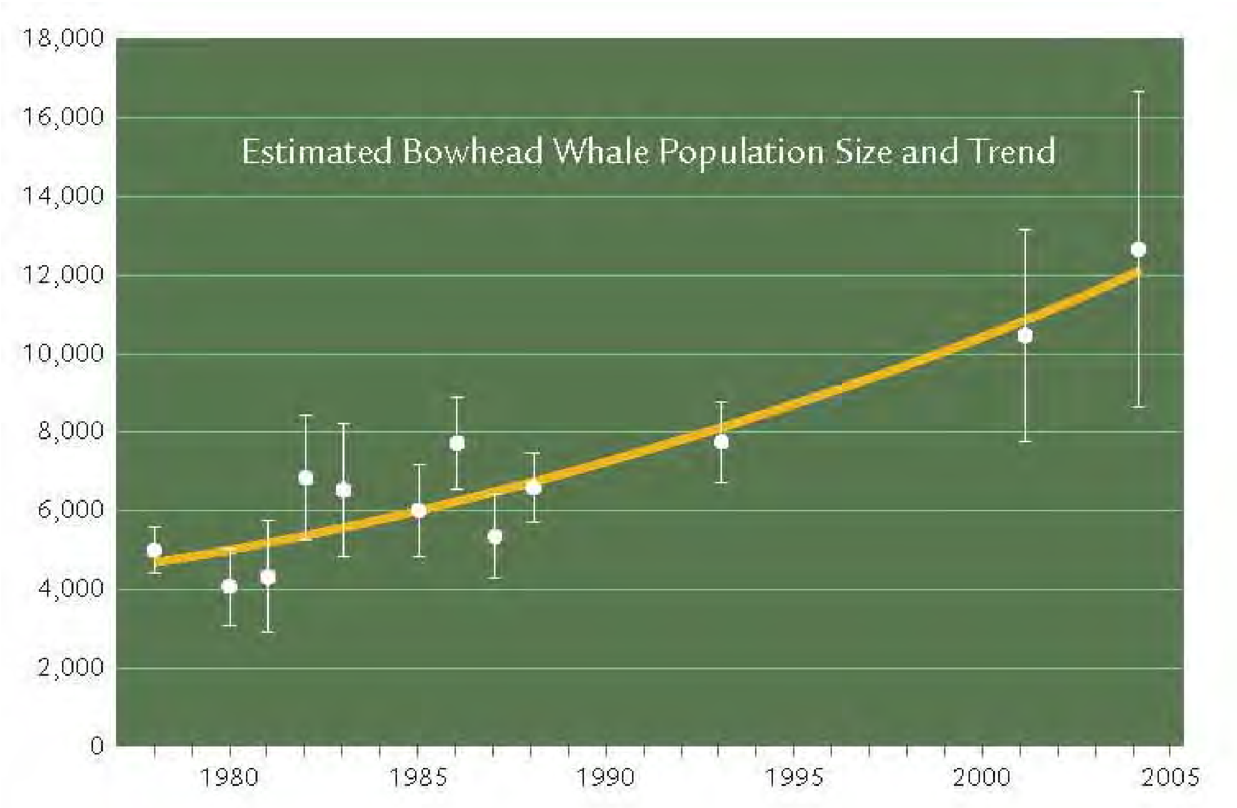

Figure 3.2.1-1 Abundance and trends of the Western Arctic bowhead whale population, 1978-2004 (from George et al., 2004a).

Comparisons between the Western Arctic stock and the Okhotsk Sea stock showed a much greater haplotypic diversity[7] (0.93) in the Western Arctic samples than in the Okhotsk Sea samples (0.61). Analyses of microsatellite and sequence data revealed significant genetic

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[7] 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.

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. No evidence was found that a small discrete stock, like the Okhotsk Sea stock, is present and killed in any numbers during the spring 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 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 St. Lawrence Island. However, the comparisons that were significant involved small sample sizes and could just as well result from genetic patterns found between different age cohorts. 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).

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 this end, the Commission has established a scientific committee. The scientific committee comprises up to 200 of the world's leading whale biologists. Many are nominated by member governments. In addition, in recent years it has invited other scientists to supplement its expertise in various areas. The size of the committee, as well as the subject matter it addresses, has increased considerably over time. In 1954, it comprised 11 scientists from 7 member nations. At the IWC annual meeting in

Agadir, Morocco in 2010 it comprised of 73 of the 88 contracting governments and observers from 7 intergovernmental organizations and 51 non-governmental organizations.

The IWC Schedule establishes 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; and (5) all aboriginal whaling shall be conducted under national legislation that accords with paragraph 13 of the schedule. In addition, the IWC Scientific Committee advises the IWC on a range of rates of increase to the MSY level. To achieve the goals of these principles, the IWC assesses aboriginal whale harvests under various catch control rules. The most important of these rules is replacement yield (RY), which estimates the number of animals that can be killed and leave the population the same size at the end of the year as at the beginning of the year. Another catch control rule, designated Q, was developed to give an appropriate catch limit across any population level to meet these principles (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 sub-paragraph 13(a).

The 1998 stock assessment of bowhead whales (IWC, 1999) reported that the RY value ranged between 108 and 123 animals and the Q value ranged between 102 and 120 animals. The IWC scientific committee reported that the population "appears to be near MSY, and would very likely increase under catches of up to 108 animals" (IWC, 1999). The 2004 stock assessment of bowhead whales (IWC, 2005a) reported that the population was close to K with a high probability of being above the MSY level based on the most recent abundance estimate from the 2001 bowhead whale census. Therefore, the use of Q (estimated to range between 137 and 324 animals, capped at 90% of MSY) was more appropriate than RY. After further analyses, the best estimate of Q was determined to be 257 bowhead whales (range: 155-412 animals; Brandon and Wade, 2006). While this range satisfies the principles for setting catch limits under sub-paragraph 13(a) of the IWC Schedule, the annual number of whales landed and struck has always fallen well below this number (Figure 3.2.1-2).

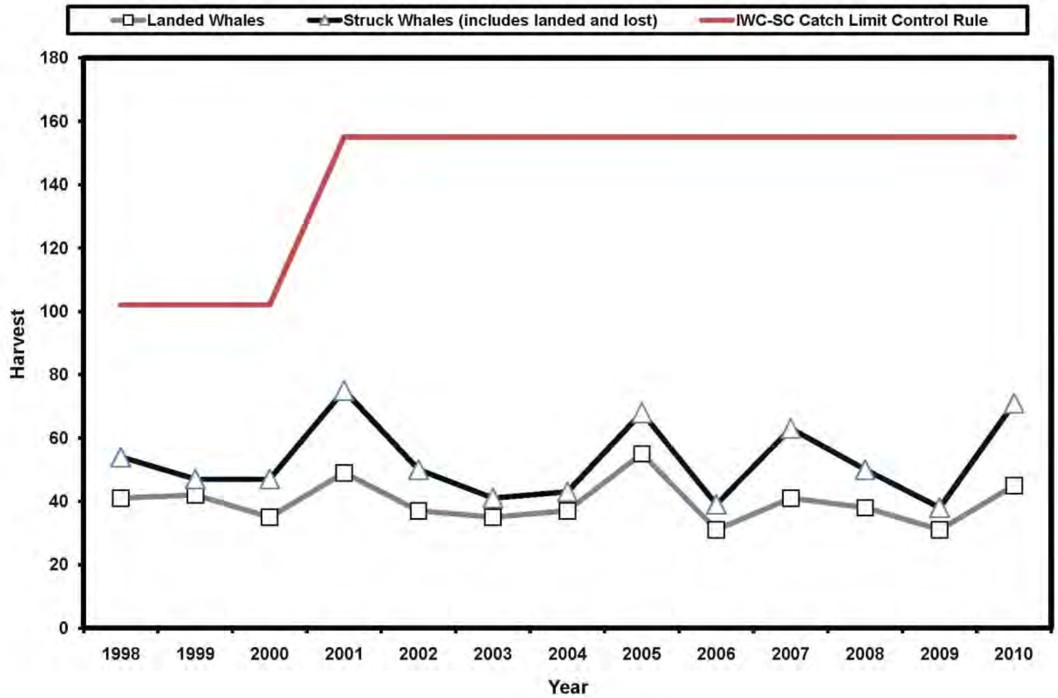

Figure 3.2.1-2 Annual number of Western Arctic bowhead whales landed and struck by Eskimo villages in Alaska, 1998-2010, compared to the IWC-SC catch limit control rule for the population Q1998-2001 = 102 whales (lower bound) and Q2002-2006 = 155 whales (lower bound).

In addition to the principles that must be followed by an IWC member nation in setting catch limits, the IWC Schedule, as adopted in 2007, also identified specific catch limits for 2008 through 2012. IWC Schedule sub-paragraph (b)(1) provided:

The taking of bowhead whales from the [Western Arctic] stock by aborigines is permitted, but only when the meat and products of such whales are to be used exclusively for local consumption by the aborigines and further provided that:

(i) For the years 2008, 2009, 2010, 2011 and 2012, the number of bowhead whales landed shall not exceed 280. 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 any year (including 15 unused strikes from the 2003-2007 quota) shall be carried forward and added to the strike quotas of any subsequent years, provided that no more than 15 strikes shall be added to the strike quota for any one year.

(ii) This provision shall be reviewed annually by the Commission in light of the advice of the Scientific Committee.

The annual number of whales landed and struck has also fallen below these specific catch limits (Figure 3.2.1-2).

Eskimos 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 quota system under the authority of the IWC since 1977. Alaska Native subsistence hunters take approximately 0.1-0.5% of the stock per year (Philo et al., 1993). Yet with a subsistence take that averages between 40 to 50 strikes per year, the Western Arctic stock has continued to grow at 3.4% annually, adding roughly 356 bowhead whales to the population in 2001 (0.034 x 10,470 whales).

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 Mammals Protection Act (MMPA). However, the Western Arctic bowhead whale population is healthy and growing under a managed hunt and has recovered to historic abundance levels. NMFS will use criteria developed for the recovery of large whales in general (Angliss et al., 2002) and bowhead whales in particular (Shelden et al., 2001) in the next five year ESA status review to determine if a change in listing status is needed (Gerber et al., 2007).

3.2.2 Migration and Distribution

General Migration Pattern. The Western Arctic stock is widely distributed in the central and western Bering Sea in winter (November to April), generally associated with the marginal ice front and found near the polynyas of St. Matthew and St. Lawrence Islands and the Gulf of Anadyr (Bogoslovskaya et al., 1982; Brueggeman, 1982; Braham et al., 1984; Ljungblad et al., 1986; Brueggeman et al., 1987; Bessonov et al., 1990; Moore and Reeves, 1993; Mel'nikov et al. 1998) (Figure 3.2.2-1). From April through June, these whales migrate north and east, following leads in the sea ice in the eastern Chukchi Sea until they pass Point Barrow, where they travel east towards the southeastern Beaufort Sea (Braham et al., 1980; Braham et al., 1984; Marko and Fraker, 1981). Most of the summer (June through September), bowhead whales are found in the Beaufort Sea (Hazard and Cubbage, 1982; Richardson, 1987; McLaren and Richardson, 1985; Richardson et al., 1986a, 1987a,b; Moore and Clarke, 1991), predominantly over outer continental shelf and slope habitats (Moore et al., 2000a). Spatial distribution seems to vary between years (Richardson et al., 1987b; Davis et al., 1983; Thomson et al., 1986), affected in part by surface temperature or turbidity fronts and anomalies (Borstad, 1985; Thomson et al., 1986).

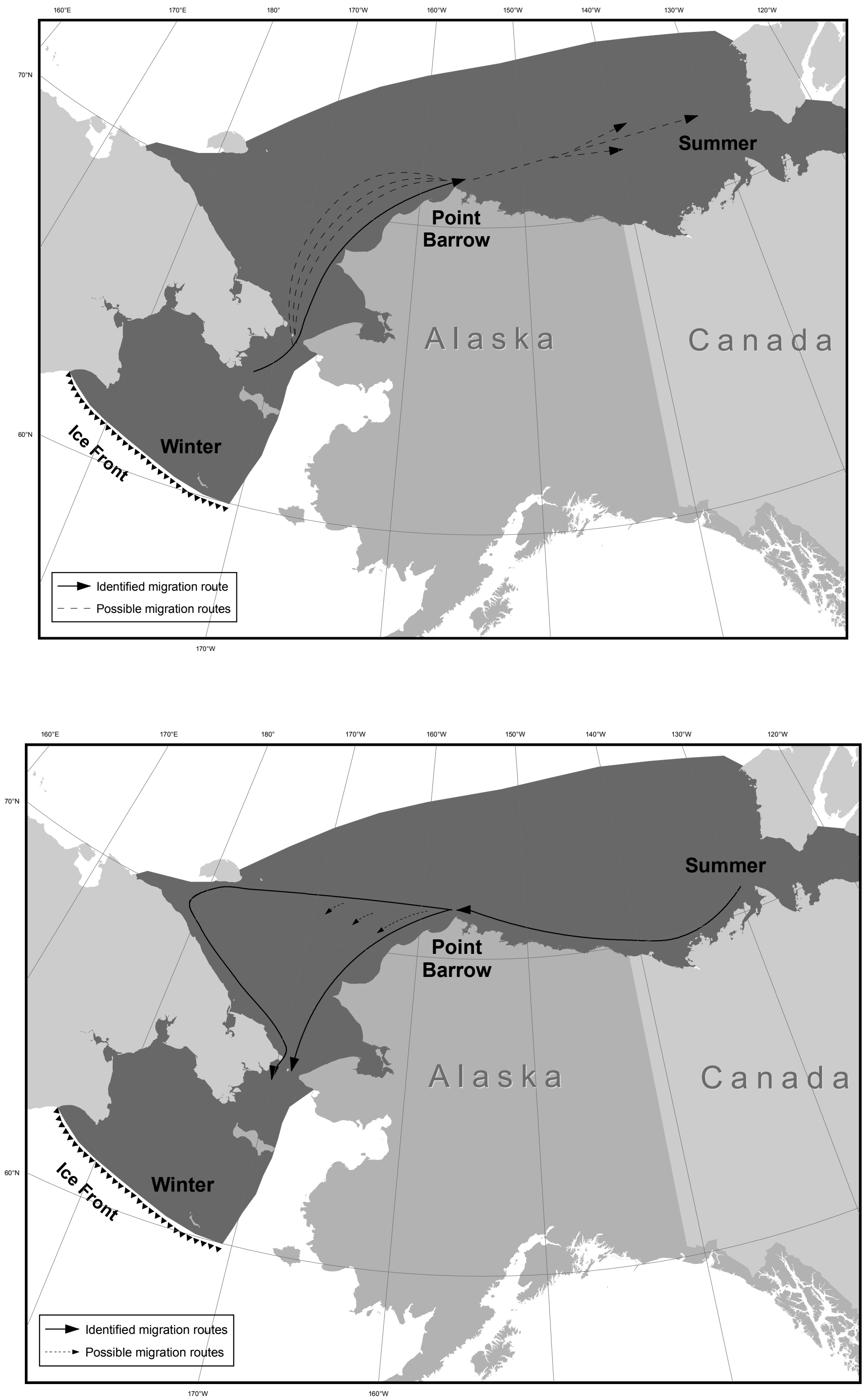

Figure 3.2.2-1 Western Arctic bowhead whale distribution and migratory patterns during the spring (a) and autumn (b) (from Allen and Angliss, 2011).

During the autumn (early September to mid-October), bowhead whales migrate across inner shelf waters (Moore et al., 2000a), moving west out of the Beaufort Sea, as evidenced during aerial surveys (Richardson, 1987; Ljungblad et al., 1987; Moore et al., 1989a; Moore and Clarke, 1991), radio-tracking (Wartzok et al., 1990) and satellite-tracking (Mate et al., 2000; Krutzikowsky and Mate, 2000) (Figure 3.2.2-1). From mid-September to mid-October bowheads are seen in the northeast Chukchi Sea, some as far north as 72°N (Moore et al., 1986; Moore and Clarke, 1992). Whales migrate into the Chukchi Sea, with some whales turning southwest along the axis of Barrow Canyon (Moore and Reeves, 1993), while others head toward Wrangel Island (Mate et al., 2000; Krutzikowsky and Mate, 2000). When they reach the Siberian coast, they follow it southeast to the Bering Strait (Bogoslovskaya et al., 1982; Zelensky et al., 1995). Autumn migrants begin arriving on the northern coast of the Chukotka Peninsula in mid-September (Mel'nikov et al., 1998), October (Mel'nikov et al., 1997), or November (Mel'nikov and Bobkov, 1994), with large inter-year differences in the timing of the autumn migration through the Chukchi Sea (Mel'nikov et al., 1998). Whales continue to arrive along the Chukotka coast even in December (Mel'nikov et al., 1998). There appears to be a split in the migration across the Chukchi Sea, with some whales crossing from Point Barrow westward toward Wrangel Island (Mate et al., 2000), and others heading more directly from Point Barrow to the Bering Strait (Moore and Reeves, 1993; Mel'nikov et al., 1998). By late October and November, many whales arrive in the Bering Sea (Kibal'chich et al., 1986; Bessonov et al., 1990), where they spend the winter.

Bowheads in the Bering or Chukchi Seas in the Summer. Very few bowhead whales are found in the Bering or Chukchi seas in summer (Dahlheim, et al., 1980; Miller et al., 1986); however, there have been enough sightings to indicate that not all bowhead whales migrate to the Beaufort Sea (Mel'nikov et al., 1998). Many have been seen in summer in the northeastern Chukchi Sea (Moore, 1992), and small groups have been observed traveling northwest along the Chukchi Peninsula in May (Bogoslovskaya et al., 1982; Bessonov et al., 1990; Ainana et al., 1995; Zelensky et al., 1995), June (Mel'nikov and Bobkov, 1993) and July (Mel'nikov et al., 1998). Studies conducted in 1994 have shown the presence of bowhead whales throughout the summer along the southeastern portion of the Chukchi Peninsula (Ainana et al., 1995) and the easternmost portion of the peninsula (Zelensky et al., 1995). Moore et al. (1995) suggested that bowheads seen in the Chukchi Sea in early October could have migrated from the Beaufort Sea three weeks earlier, as whales seen in the Alaskan Beaufort Sea in August and early September were often swimming in a westerly direction (Moore et al., 1989b).

Segregation by Size and Sex. During the spring migration, temporal segregation by size and sex class 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). Along the Chukchi Peninsula, Russian Chukotkan Natives noted the appearance of large numbers 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; encounter rates 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 or sex class was not confirmed as the cause.

3.2.3 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. 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).

3.2.4 Subsistence Hunts

Eskimos 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 Eskimos may have taken 20 whales a year (Ellis, 1991), and this level was not detrimental to the bowhead population:

> 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. However, modern technology has changed the potential for any lethal hunting of this whale to cause population-level adverse effects if unregulated (Minerals Management Service [MMS], 2006a:201).

Partly as a result of concerns about sustainability, subsistence takes have been regulated by a 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) to 55 (in 2005) 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 3.2.4-1). Hunters from the western Canadian Arctic community of Aklavik (Figure 1.1.2-1) killed one whale in 1991 and one in 1996 (kills that were not approved by the IWC). As part of the shared quota with the Russian Federation, one animal was killed by Russian subsistence hunters in each of 1999 and 2000, three in 2003 (Borodin, 2004), one in 2004 (Borodin, 2005), two in 2005 (IWC, 2007), two in 2008 (IWC, 2009), and two in 2010 (IWC, 2011a,b) (Figure 3.2.4-1). Descriptions of the Alaska hunts and their management are provided in Sections 3.4 and 3.5, respectively.

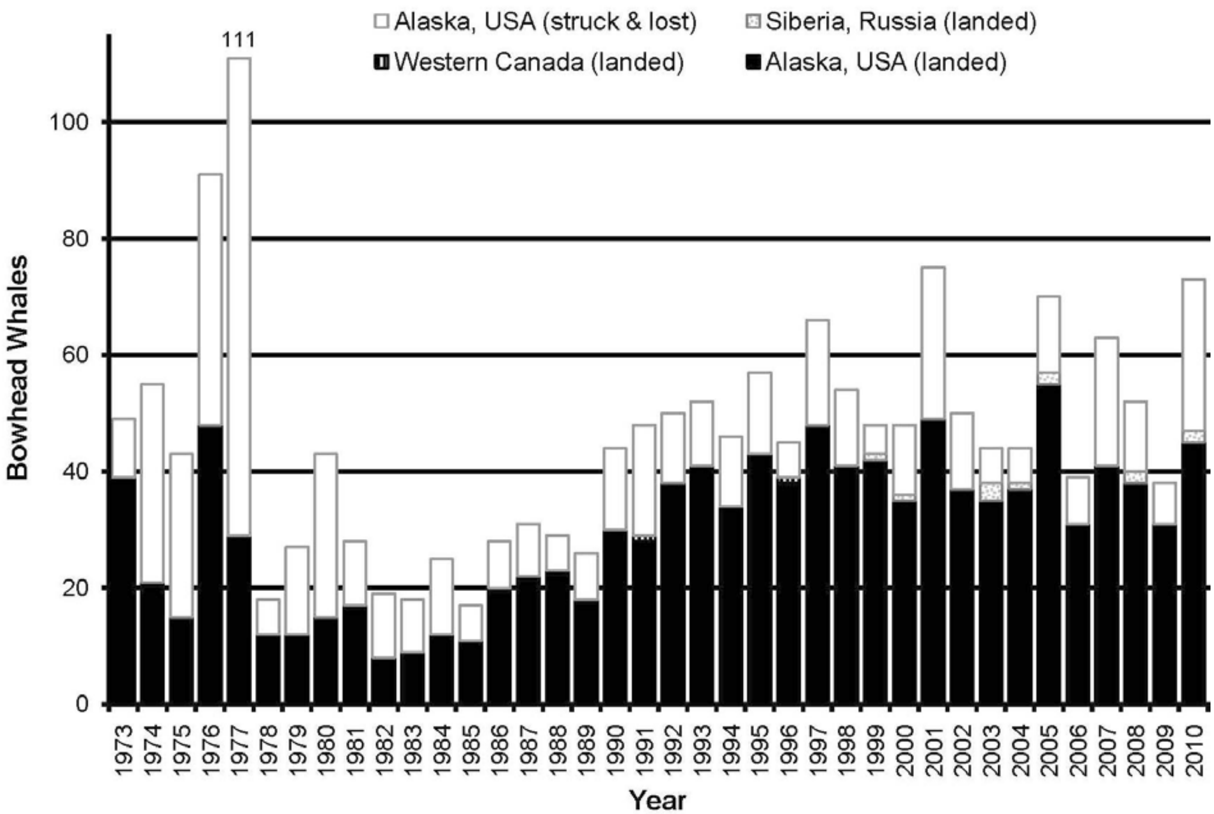

Figure 3.2.4-1 Number of bowhead whales landed, and struck and lost by subsistence hunters in the U.S., Canada and Russia, 1974-2010.

3.2.5 Natural Mortality

Little is known 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 significant effects (Albert, 1981; Shotts et al., 1990); Bratton et al. (1993), however, concluded that such encounters were not likely to be hazardous.

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 small, given that this species is so 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. The frequency of attacks is unknown and killer whale distribution in northern waters has not been well documented (George et al., 1994). Of 195 whales examined during the Alaskan subsistence harvest (1976-92), eight had been wounded by killer whales (George et al., 1994). Seven of the eight bowhead whales were greater than 13 meters (m) in length, suggesting either that scars are accumulated over time or that young animals survive a killer whale attack. Overall, the frequency of attacks on bowhead whales in the Bering Sea stock appears to be low (George et al., 1994). However, from the available data, it is not possible to assess the level of predation on bowhead whales by killer whales, particularly in terms of size-class selection and encounter rates.

3.2.6 Contaminants

A number of contaminants persist in the Arctic marine environment including polychlorinated biphenyls (PCBs), Dichlorodiphenyltrichloroethanes (DDTs), organochlorines and chlordanes. However, very limited data are available on baseline hydrocarbon concentrations in prey or tissues of bowhead whales, and on the normal biochemical and histologic (microscopic) determinants used to assess oil related 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 Barrow, Alaska, in 2002 (Willetto et al., 2002). Similar to other mysticetes, bowhead whale samples showed that among different blubber strata there may be differences in vertical distribution of organochlorines as well as lipid content. 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 triglycerides (94% to 100%). The mean lipid concentrations were significantly different among the three collection years (1998, 1999, 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, DDT, hexachlorocyclohexanes (HCHs), chlordanes, chlorobenzenes) to investigate bioaccumulation and biotransformation (Hoekstra et al., 2002a, b). In general, 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. 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 high in Arctic marine mammals; however, Hg and Se were comparably very low in bowhead whales (Woshner et al., 2001, 2002; O'Hara et al., 2006). In summary, contaminant levels for bowhead whales varied by gender, length (i.e., age), and season, but were relatively low compared to other marine mammals.

3.2.7 Fishery Interactions

The NMFS National Observer Program has no records of bowhead whale mortality incidental to commercial fisheries in Alaska (Angliss and Outlaw, 2005). However, several cases of rope or net entanglement have been reported from whales taken in the subsistence hunt (Philo et al., 1993), including those summarized in Table 3.2.7-1. Further, preliminary counts of similar observations based on reexamination of bowhead harvest records indicate that entanglements or scarring attributed to ropes may include over 20 cases (J.C. George, Department of Wildlife Management, North Slope Borough [NSB], personal communication). Alaska region stranding reports document at least two bowhead whale entanglements between 2001 and 2005. Some bowhead whales have had interactions with crab pot gear, one in 1993, one in 1999, and one in 2010. The estimated average annual rate of known entanglement in U.S. commercial fishing gear is 0.2 for 2001-2005, based on the entangled whale observed off Point Barrow in 2004. The total estimate annual rate of known entanglement in marine debris/gear for the past five years is 0.4. (Angliss and Outlaw, 2007).

Table 3.2.7-1
Evidence of Bowhead Whales Interacting with Ropes, Fishing Gear and Vessels, 1978-2011

Year	Number of Whales	Location	Description
1978	1	Wainwright	6 scars on caudal peduncle
1986	1	Kaktovik	Scars on caudal peduncle and anterior margin of flukes
1989	1	Barrow	12 scars on ridges of caudal peduncle
1989	1	south of Gambell, St. Lawrence Island	Rope wrapped around head, through mouth and baleen
1989*	1	Barrow	Rope ~32m long trailing from mouth
1990	1	Barrow	Whale had 3/4 inch thick yellow nylon probably buoy line for crab pot, in its mouth and rope burns on its tail, scars on caudal peduncle; 2 ropes trailing from mouth.
1991*	1	Barrow	Apparent rope scar from mouth, across back
1993**	1	Barrow	Large female with crab pot line wrapped around flukes
1998**	1	Northwest of Kotzebue; near Red Dog Mine dock, Kivalina	First seen floating; beach-cast on 6/29/1998. Photos show single line coming off animal; 3 small yellow/orange buoys collected and brought to fishing supply store. Storekeeper reported buoys were cosmopolitan but not recently used, likely jury rigged. One float had wear that suggested it had been towed for 'some time'.
1999**	1	Barrow	Whale entangled in confirmed crab gear. Line wrapped through gape of mouth, flipper, and peduncle. Severe injuries.
2003**	1	Near Ugashik Bay, Cinder River, Bristol Bay	Stranded with rope tied around the peduncle; entangled
2004**	1	Kaktovik	Boat propeller marks
2004**	1	Barrow	Alive, whale had fishing net and rope wrapped around head and swam "slow". No attempt to disentangle
2010**	1	Kotzebue Sound	Crab pot gear was entangled through the mouth and around the peduncle
2011	1	Barrow	Whale alive and swimming with a line that appears to be wrapped around the caudal peduncle and trailing behind.

Philo et al., 1993; * D. Rugh, NMFS, personal communication; ** J.C. George, NSB, personal communication

3.2.8 Offshore Activities, Petroleum Extraction

Oil and gas exploration and development are increasingly active in the Chukchi and Beaufort Sea in portions of the Western Arctic bowhead whale stock habitat. Extensive information about the effects of oil and gas activities on bowhead whales is discussed in several documents: (1) a Biological Opinion prepared by NMFS for the MMS pursuant to Section 7 of the ESA on Oil and Gas Leasing and Exploration Activities in the Beaufort Sea, Alaska (NMFS, 2006); (2) Environmental Impact Statement (EIS) prepared pursuant to the National Environmental Policy Act (NEPA) for the Beaufort Sea Planning Area, Oil and Gas Lease Sale, Sales 186, 195, and 202 (MMS, 2003); (3) an Environmental Assessment (EA) prepared by the MMS for proposed Outer Continental Shelf (OCS) Lease Sale 202 - Beaufort Sea Planning Area (MMS, 2006a); (4) Final Programmatic EA Arctic Ocean OCS Seismic Surveys 2006 (MMS, 2006b); (5) Final EIS for the Chukchi Sea Planning Area Oil and Gas Lease Sale 193 and Seismic Surveying Activity in the Chukchi Sea (MMS, 2007a); (6) 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); and (7) Draft EIS – Outer Continental Shelf Oil and Gas Leasing Program: 2012- 2017 (BOEM 2011). Additional information is presented on the Bureau of Ocean Energy Management (BOEM) Alaska OCS Region website: http://www.boem.gov/About-BOEM/BOEM-Regions/Alaska-Region/Index.aspx.

There have been ten federal oil and gas lease sales within the Alaskan Beaufort Sea beginning with the Joint State of Alaska - Federal Sale held in December 1979. The most recent federal sale in the Beaufort Sea planning area was 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 for 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.

Options for the Federal OCS Lease Sales during the five year period from 2012-2017 include one lease sale in the Beaufort Sea Planning Area proposed for 2015. The lease sale area would establish a bowhead whale migration deferral zone comprised of the following areas:

- The Barrow Subsistence Whaling Area that defers 49 whole or partial blocks located at the western border of the planning area; and
- The Kaktovik Subsistence Whaling Area that defers 28 whole or partial blocks located offshore of Kaktovik (BOEM 2011).

Likewise, the options for leasing during the five year period from 2012-2017 include one lease sale in the Chukchi Sea Planning Area to occur in 2016. The lease sale area would establish a 40 km (25 miles [mi.]) buffer deferral corridor along the Chukchi Sea coast, which would provide additional protection from potential impacts to bowhead whales during their spring migration (BOEM 2011). Prior to 2000, no permanent facilities, or oil production, existed on the Beaufort

Sea OCS outside of state waters. There are presently two offshore production facilities within state waters in the Beaufort Sea: Northstar and Endicott. Five exploration wells were drilled in the Chukchi Sea planning area between 1989 and 1991, but as of December 2011, 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, 1999, 2001a, 2006). These oil and gas activities introduce noise into the marine environment that may disturb bowhead whales. Multiple marine geophysical (seismic) projects are planned for the Beaufort and Chukchi seas in the foreseeable future. Additional information on recent and planned oil and gas exploration and development activity is found in Sections 4.6.1.1 and 4.6.1.2.

Noise has been shown to cause avoidance behavior in migrating bowhead whales. Seismic activities and the use of ice breakers to support OCS activities present the highest probability for avoidance of any of the activities associated with oil exploration (NMFS, 2006). Studies have shown noise from ice breakers may be detected by acoustic instruments at distances exceeding 50 km (NMFS, 2003). It is reasonable therefore, to assume that bowheads could also detect this noise at this distance. The distance at which bowheads may react to noise is poorly described, but may exceed 20 km for marine seismic surveys as described below. 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. At present, researchers have insufficient information on the hearing ability and sensitivities of bowhead whales to adequately describe this potential. Information suggests 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.

Seismic Surveys. Seismic surveys in Alaska are scheduled in the summer and fall and 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 occur 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). 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 are quoted as chamber volumes in cubic inches (in^3), 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 ranges between 233 and 240 dB relative to 1 micropascal at 1 meter (dB re 1 μPa at 1 m)[8] (MMS, 2006b). Seismic sounds vary, but a typical 2-D/3-D seismic survey with multiple guns would emit 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 downward (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).

While high noise levels may affect whale hearing, or impact whales' use of sound to communicate or navigate, studies conducted on seismic research in the Beaufort Sea show that such effects on bowhead whales appear to be temporary, below exposure levels likely to cause injury or death, and therefore unlikely to prevent the survival and recovery of this species, provided these activities are properly authorized and mitigated. 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 chairman, Alaska Eskimo Whaling Commission (AEWC), personal communication; H. Aishanna, Kaktovik Whaling Captain, personal communication, Kaktovik Whaling Captains Association, personal communication).

Site-Clearance Survey Activities. High-resolution seismic surveys primarily are used by the oil and gas industry 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 for more output (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 bowhead whales. 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).

Drilling. After seismic surveys indicate that commercially feasible quantities of oil or gas are 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.,

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[8] 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).

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 range 10 km only during unusually quiet periods; the usual audible range would be approximately 2 km (Richardson et al., 1995a). Davies (1997) concludes that bowheads avoided an active drilling rig at a distance of 20 km.

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 stronger 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. In any year in which offshore seismic activities occur in the Beaufort Sea, many bowheads may be "taken" by harassment. NMFS estimated the level of seismic takes between 1,275 and 2,550 in 2000. However, considerable variability is associated with any such estimate; NMFS would not expect this number of bowhead whales to be harassed year after year. No estimation of bowhead whale takes due to noise from the Endicott project is available (NMFS, 2001a). However, Endicott is near shore and in relatively shallow waters, through which noise propagation into areas used by bowhead whales would be greatly attenuated. Bowhead whales are not likely to be affected by noise from the Endicott project due to its distance from the bowhead's autumn migration route and the limited distance that noise travels from gravel structures into the marine environment.

In summary, more sound is radiated underwater during drilling operations from drill ships than from semisubmersibles. In contrast, noise from drilling on 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). By far, the noisiest exploratory activity is seismic surveys.

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). 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, personal communication). 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 Barrow, which could affect a large portion of the population. The likelihood of this is debatable, depending on how oil development proceeds in the Chukchi Sea (Craig George, North Slope Borough, personal communication, 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, nonlethal effects. 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, 2006f). However, there are no data available that definitely 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 to come in contact with large amounts of freshly spilled oil. The uncertainty arises because:

- of the unique ecology of the bowhead whale;
- existing information about the effects of oil on very large cetaceans is inconclusive and, thus, it is not possible to confidently estimate the likelihood that serious injury to individuals of bowhead whales could or would occur with oil exposure;
- there is lack of agreement over the interpretation of post-Exxon Valdez oil-spill cetacean studies;
- there are not data sufficient to determine the vulnerability of newborn or other baleen calves to freshly spilled crude oil;
- 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
- 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, 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 so affected 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, 2001a).

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 Allen and Angliss, and is hereby incorporated by reference (2011).

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 Alaskan villages hunt a variety of marine mammals including the bearded seal, ringed seal, spotted seal, ribbon seal, beluga whale, bowhead whale, polar bear, and walrus (MMS, 2002a). A discussion of the current status and trends of all marine mammals that inhabit the area where Alaska Eskimos 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 reliable estimate of spotted seal population abundance, abundance trends, and stock structure in Alaska is currently not available (Rugh et al., 1997; Boveng et al., 2009). A population estimate of 141,479 (95% CI 92,769-321,882) spotted seals was calculated for areas surveyed within the eastern and central Bering Sea in 2007 (Ver Hoef et al., in review). Currently, the Bering Sea DPS does not warrant listing under the ESA (74 Federal Register [FR] 53683, 20 October 2009).

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 (Allen and Angliss, 2011). At this time, there are no efforts to quantify the total statewide level of harvest of spotted seals by all Alaska communities (Allen and Angliss, 2011).

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).

Reliable estimates of abundance, abundance trends, and stock structure are not available. 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). Early estimates of the Bering-Chukchi Sea stock range from 250,000 to 300,000 animals (Popov, 1976; Burns, 1981a; Burns et al., 1981a). Based on studies by Ver Hoef et al. (2010), Fedoseev (2000) and Bengtson et al. (2005), Cameron et al. (2010) estimated about 125,000 bearded seals in the Bering Sea and 27,000 bearded seals in the Chukchi Sea. Cameron et al. (2010) did not present population estimates for the East Siberian and Beaufort seas, but did estimate that the Beringia DPS contained approximately 155,000 bearded seals. Currently, NMFS has proposed that the Okhotsk and Beringia DPSs be listed as threatened under the ESA (75 FR 77496, 10 December 2010).

Bearded seals are an important species for Alaskan subsistence hunters, with estimated annual harvests of 6,788 (Angliss and Outlaw, 2005). Data on community subsistence harvests are no longer being collected and no new annual harvest estimates exist. At this time, there are no efforts to quantify the total statewide level of harvest of bearded seals by all Alaska communities (Allen and Angliss, 2011).

Ribbon Seal. Ribbon seals (*Phoca fasciata*) inhabit the North Pacific Ocean and adjacent fringes of the Arctic Ocean, most commonly in the Okhotsk and Bering seas (Burns, 1981b). During the breeding season, ribbon seals are found only in the pack ice of the Okhotsk and Bering seas (Kelly, 1988a). In Alaska waters, ribbon seals are found in the open sea, on the pack ice, and only rarely on shorefast ice (Kelly, 1988a). Ribbon seals in Alaska range northward from Bristol Bay in the Bering Sea into the Chukchi and western Beaufort seas (Burns, 1970, 1981b; Braham et al., 1984; Moore and Barrowclough, 1984), inhabiting the northern part of the Bering Sea ice front from late March to early May (Burns, 1970, 1981b; Braham et al., 1984), and moving north with the receding ice edge in May to mid-July (Shustov, 1965; Tikhomirov, 1966; Burns, 1970, 1981b; Burns et al., 1981a). Ribbon seals usually haul out on thick pack ice (Shustov, 1965; Tikhomirov, 1966; Burns, 1981b; Burns et al., 1981a) and only rarely on shorefast ice (Bailey, 1928). In April, they have been found throughout the ice front but most abundantly over deep water south of the continental shelf (Braham et al., 1984). As the sea ice recedes in May-June, two major rafted remnants of the pack ice remain: the Alaskan massif (from Bering Strait to eastern St. Lawrence Island and south to Nunivak Island) and the Anadyr massif (from the Gulf of Anadyr toward St. Matthew Island); ribbon seals are thought to be associated with the Anadyr massif (Burns et al., 1981b). Little is known of the distribution of ribbon seals after the ice recedes from the Bering Sea (Kelly, 1988a); they are presumed to be solitary and pelagic in summer and autumn but their distribution is unknown (Burns, 1981b). Many ribbon seals may migrate north to the Chukchi Sea during the summer (Kelly, 1988a), while others may remain pelagic in the Bering Sea, near the edge of the continental shelf (Burns, 1970, 1981b). Single ribbon seals have been observed during the summer (June-August) within 135 km (84 mi.) of the Pribilof Islands (Burns, 1981b), near Cordova, Alaska (Burns, 1981b) and south of the Aleutian Islands (Stewart and Everett, 1983).

A reliable estimate of abundance, abundance trends, and stock structure for the Alaska stock of ribbon seals is currently not available (Allen and Angliss, 2011). The worldwide population of ribbon seals was estimated at 240,000 in the mid-1970s, with an estimate of 90,000 to 100,000 in the Bering Sea (Burns, 1981b). A provisional estimate of 49,000 ribbon seals in the eastern and central Bering Sea was developed based on aerial surveys conducted in spring of 2003 (Simpkins et al., 2003), 2007 (Cameron and Boveng, 2007; Moreland et al., 2008), and 2008 (Peter Boveng, National Marine Mammal Laboratory [NMML], unpublished data). 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, 30 December 2008).

Ribbon seals are also taken by Alaska Native subsistence hunters, primarily from villages in the vicinity of the Bering Strait and to a lesser extent at villages along the Chukchi Sea coast (Kelly, 1988a). The annual subsistence harvest was estimated to be less than 100 seals annually from 1968 to 1980 (Burns, 1981b). As of August 2000; the subsistence harvest database indicated that the estimated number of ribbon seals harvested for subsistence use per year is 193. Data on community subsistence harvests are no longer being collected and no new annual harvest estimates exist (Allen and Angliss, 2011).

Ringed Seal. Ringed seals (*Phoca hispida*) are found throughout the arctic in areas of seasonal sea ice as well as in areas covered by the permanent polar ice cap (McLaren, 1958; Smith, 1987; Kelly, 1988b; Ramsay and Farley, 1997; Reeves, 1998). Most taxonomists currently recognize five subspecies of ringed seals of which *Phoca hispida hispida* occurs in the Arctic Ocean and Bering Sea (Kelly et al., 2010a). Most ringed seals overwinter, breed, give birth, and nurse their young within the shorefast sea ice (McLaren, 1958; Smith and Stirling, 1975), although some breeding seals (and pups) have been observed in pack ice (Finley et al., 1983). In the Chukchi and Beaufort seas, ringed seals haul out in highest densities in shorefast ice during the May-June molting season, immediately following the March-April pupping season (Johnson et al., 1966; Burns and Harbo, 1972; Frost et al., 1988, 1997, 1998, 1999). Although details of their seasonal movements have not been adequately documented, it is generally considered that most ringed seals that winter in the Bering and Chukchi seas migrate north in spring as the seasonal ice melts and retreats (Burns, 1970) and spend summer 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 (Freitas et al., 2008; Kelly et al., 2010b). With the onset of freezeup in the fall, ringed seal movements become increasingly restricted and 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). Many adult ringed seals return to the same small home ranges they occupied during the previous winter (Kelly et al., 2010b). A reliable estimate of abundance, abundance trends, and stock structure for the Alaska stock of ringed seals is currently not available (Allen and Angliss, 2011). Crude estimates of population in Alaskan waters include 1 - 1.5 million (Frost, 1985) or 3.3 - 3.6 million, based on aerial surveys conducted in 1985, 1986, and 1987 (Frost et al., 1988). The most recent surveys were conducted in the Beaufort Sea in the 1990s (Frost et al., 2002) and the eastern Chukchi Sea in 1999 and 2000 (Bengtson et al., 2005). Abundance estimates for the Chukchi survey area were 252,488 (SE = 47,204) in 1999 and 208,857 (SE = 25,502) in 2000 but this only represents a portion of the Alaska stocks range and surveys were conducted over a decade ago. After the status review of the ringed seal was complete (Kelly et al. 2010a), NMFS proposed listing four subspecies of ringed seals—including *Phoca hispida hispida*, and; therefore, the Alaska stock of ringed seals—as threatened under the ESA (75 FR 77496, 10 December 2010).

Ringed seals are an important species for Alaska Native subsistence hunters. As of August 2000; the subsistence harvest database indicated that the estimated number of ringed seals harvested for subsistence use per year is 9,567. Data on community subsistence harvests are no longer being collected and no new annual harvest estimates exist (Allen and Angliss, 2011).

Pacific Walrus. The Pacific walrus (*Odobenus rosmarus*) occurs primarily in the shelf waters of the Bering and Chukchi seas (Allen, 1880; Smirnov, 1929). Most of the population congregates during the summer in the southern edge of the Chukchi Sea pack ice between Long Strait, Wrangell Island, and Point Barrow (Fay et al., 1984). The remainder of the population, primarily adult males, stays in the Bering Sea during summer (Brooks, 1954; Burns, 1965; Fay, 1955, 1982; Fay et al., 1984). Females and sub-adult males migrate toward Bering Strait in the autumn when the pack ice begins to re-form (Fay and Stoker, 1982). Walruses use terrestrial haulout sites when suitable haulout sites on ice are unavailable. The major haulout sites are located along the northern, eastern, and southern coasts of the Chukchi Peninsula, on islands in the Bering Strait, on the Punuk Islands, on Round Island in Bristol Bay (Lentfer, 1988), and at Cape Seniavan on the north side of the Alaska Peninsula.

The current size and trend of the Pacific walrus population is unknown (Gorbics et al., 1998; Allen and Angliss, 2011). The total initial estimate of 270,000 to 290,000 animals in 1980 was later adjusted to about 250,000 (Fay et al., 1984; Fedoseev, 1984). A joint U.S.-Russia survey in 2006 led to an estimate of 129,000 (95% CI 55,000-507,000) walrus for the ice habitat areas surveyed (Speckman et al., in prep). This estimate is negatively biased as it does not include areas that were not surveyed that are known to have walrus present (Allen and Angliss, 2011). Subsistence harvest mortality levels in the U.S. for 2003 - 2007 ranged from 1,630-1,918 animals per year (Allen and Angliss, 2011). The U.S. Fish and Wildlife Service (USFWS) has determined that the Pacific walrus warrants protection under the ESA, but an official rulemaking to propose that protection is currently precluded by the need to address other higher priority species. As a result, the walrus will be added to the agency's list of candidates for ESA protection and its future status will be reviewed annually (76 FR 7634, 10 February 2011).

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). A reliable population estimate for the Chukchi/Bering seas stock currently does not exist (Allen and Angliss, 2011). A population estimate of 1,526 (95% CI=1211−1841; 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, 15 May 2008). 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 Alaska's polar bears were hunted primarily by Alaska Natives, 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.

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 (Allen and Angliss, 2011). 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).

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). Since 2010, overlap in the ranges of these two stocks have been identified 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. 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. A portion 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).

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). Therefore, NMFS proposed, on November 22, 1991 (56 FR 58869), 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, January 7, 1993) 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 most recent southbound counts were made during the 2000/01, 2001/02, and 2006/07 census. 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. (2009) 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 new abundance estimates between 1967 and 1987 were generally larger than previous abundance estimates; differences by year between the new abundance estimate and the old estimate range from -2.5% to 21%. However, the opposite was the case for survey years 1992 to 2006, with estimates 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 show 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). Now the peak estimate is a decade earlier in 1987/88. The revised estimates for the most recent years are 16,369 (Coefficient of Variation [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., 2009).

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 and 2000 was less than one-third of that in the previous years (1996 - 1998). 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 - 2004 returned to the level seen in pre-1999 years, 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 those years; 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 2006/07 of 19,126 (CV 0.071) gray whales, suggests the population has nearly increased back up to the level seen in the 1990s before the mortality event in 1999 and 2000 (Allen and Angliss, 2011).

Subsistence hunters in Washington State and the Russian Federation have traditionally harvested whales from this stock (Allen and Angliss, 2011). The U.S. and the Russian Federation have agreed that the IWC quota (capped at 140 whales per year) would be shared with an average annual harvest of 120 whales by the Russian Chukotka people and four whales 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, 2001a), 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, 2001a). Based on this information, the annual subsistence take averaged 122 whales during the five year period from 1999 to 2003. Total takes by Russian aboriginals were 126 in 2003 (Borodin, 2004), 110 in 2004 (IWC, 2006), 115 in 2005 (IWC, 2007), 129 in 2006 (IWC, 2008), and 126 in 2007 (IWC, 2009). Based on this information, the annual subsistence take averaged 121 whales during the five year period from 2003 to 2007.

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 may occur in both offshore and coastal Alaskan waters, with concentrations in areas now designated as separate stocks: Bristol Bay, eastern Bering Sea, eastern Chukchi Sea, and Beaufort Sea (Angliss et al., 2001). Most beluga whales from these summering areas are assumed to overwinter in the Bering Sea, but few data exist to support this conclusion (O'Corry-Crowe et al., 1997; O'Corry-Crowe and Lowry, 1997). The Bristol Bay and eastern Bering Sea stocks occur within the Bering Sea/Aleutian Islands and Gulf of Alaska.

The population abundance estimate for the Bristol Bay stock is 2,877 animals, 18,142 animals in the eastern Bering Sea stock, 3,710 animals in the eastern Chukchi Sea stock, and 39,258 animals in the Beaufort Sea stock (Allen and Angliss, 2011). Current population trends for the

Beaufort Sea and eastern Bering Sea stocks are unknown (Allen and Angliss, 2011). The Bristol Bay stock is considered stable and increasing (Lowry et al., 2008) and there is no evidence that the eastern Chukchi Sea stock is declining (Allen and Angliss, 2011). The annual subsistence take by Alaska Natives between 2002 - 2006 averaged 25.4 animals per year from the Beaufort Sea stock, 59 animals per year from the eastern Chukchi sea stock, 197 animals per year from the eastern Bering Sea stock, and 17 animals per year from the Bristol Bay stock (Allen and Angliss, 2011). These estimates may be negatively biased because of unreliable estimates of struck and loss rates during subsistence hunts. The Alaska Beluga Whale Committee monitors the subsistence harvest of beluga whales (Frost and Suydam, in press; Allen and Angliss, 2011). Since 2006, Alaska Native hunters have landed the following number of beluga whales for the years 2007 through 2009: Beaufort Sea stock – 40, 48, and 16 whales; Chukchi Sea stock – 270, 74, and 53 whales; eastern Bering Sea stock – 232, 119, and 181 whales; and Bristol Bay stock – 20, 19, and 20 whales (Alaska Beluga Whale Committee, personal communication 18 February 2010).

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 (Allen and Angliss, 2010).

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, personal communication). The most recent harvest (two whales) in Alaska occurred in 1989 (IWC, 1991).

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 have not been any additional reported takes of humpback whales from this stock by subsistence hunters in Alaska or Russia. The humpback whale is listed as endangered under the ESA, and therefore designated as depleted under the MMPA. 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 (Allen and Angliss, 2011). Reliable estimates of current and historical abundance for the entire Northeast Pacific fin whale stock are currently not available. 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 2,084 killer whales belong to the eastern North Pacific Alaska resident stock (Allen and Angliss, 2011). 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 3.3% per year from 1984 to 2002 (Matkin et al., 2003). 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 552 transient killer whales has been estimated for the Gulf of Alaska, Aleutian Islands, and Bering Sea Transient stock (Allen and Angliss, 2011). There is no reported subsistence harvest of killer whales in Alaska (Allen and Angliss, 2011).

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 (Allen and Angliss, 2011).

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 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).

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 Eskimos in 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 Eskimos 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).

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 Code of Federal Regulations [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 species is known to breed on only two remote islands in the western Pacific. Chicks leave the nest after five months to go to the North Pacific. 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 2,400 short-tailed albatrosses are known to exist (USFWS, 2008). 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).

Spectacled Eider. The spectacled eider (*Somateria fischeri*) is a threatened species under the ESA and 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% of the estimated 363,000 world population (MMS, 2002a) of 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], 2001b). 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, 2001b, 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, 2001b).

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).

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, 2001c). 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, 2002a). 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, such as 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, 2002a). 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).

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 Eskimos (MMS, 2002a).

Fish species used by Alaska Eskimos in 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 Eskimos in 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 that 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% are Alaska Native or part Alaska Native (Table 3.4-1). Barrow accounts for just over half of the total population, and is more diverse, with Alaska Native residents making up 68.6% of the community. The recent trend in population for these communities is a slight decline since the 2000 census, when the total population for these communities was 8,822 residents (6.4% decrease) and 6,674 Alaska Native residents (2.6%) (U.S. Census Bureau, 2010). Alaska Native residents now make up a slightly larger proportion (3.2% increase) of the region's total population.

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

Community	Total Population 2000	Percent Alaska Native 2000	Alaska Native Population 2000	Total Population 2010	Percent Alaska Native 2010	Alaska Native Population 2010	Total Population Percent Change (2000 – 2010)	Alaska Native Population Percent Change (2000 – 2010)
Barrow	4,581	64.00%	2,933	4,212	68.60%	2,889	-8.06%	-1.50%
Diomede	146	93.80%	137	115	95.70%	110	-21.23%	-19.71%
Gambell	649	95.80%	622	681	96.00%	654	4.93%	5.14%
Kaktovik	293	84.00%	246	239	90.00%	215	-18.43%	-12.60%
Kivalina	377	96.60%	364	374	97.90%	366	-0.80%	0.55%
Nuiqsut	433	89.10%	386	402	89.60%	360	-7.16%	-6.74%
Point Hope	757	90.60%	686	674	93.30%	629	-10.96%	-8.31%
Point Lay	247	88.30%	218	189	88.90%	168	-23.48%	-22.94%
Savoonga	643	95.50%	614	671	94.90%	637	4.35%	3.75%
Wainwright	546	93.00%	508	556	91.70%	510	1.83%	0.39%
Wales	150	90.10%	137	145	93.80%	136	-3.33%	-0.73%
Total	8,822	77.65%	6,851	8,258	80.80%	6,674	-6.39%	-2.58%

Source: US Census, 2010

The most current information concerning income and poverty levels is the 2005–2009 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. When the 2010 Census data on poverty levels are released, estimates will become more accurate. 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 six communities have intermediate rates (10% - 18% of residents). The remaining three communities have higher rates, ranging from 41% through 59.1% 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 9.6%, and in many cases these rates are two and three times the Alaska average.

Table 3.4-2
Portion of Residents Living Below Poverty Level

Community	Percent 2000	Percent 2005-09
Barrow	8.62%	17.9%
Diomede	35.44%	52.1%
Gambell	28.47%	40.7%
Kaktovik	28.47%	10.4%
Kivalina	26.40%	12.3%
Nuiqsut	2.37%	0.5%
Point Hope	14.83%	8.0%
Point Lay	7.4%	16.8%
Savoonga	29.06%	59.1%
Wainwright	12.54%	12.7%
Wales	18.30%	16.2%
State of Alaska Rate	9.4%	9.6%

Source: U.S. Census Bureau American Fact Finder 2011

3.5 Eskimo Tradition of Subsistence Hunt of Bowhead Whales

Bowhead whale hunting has been a part of Alaska Eskimo 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 subsistence 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 on-going 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.

Bowhead subsistence whaling represents an especially important source of subsistence food among the AEWC communities. During the past 10 years (2001 – 2010), the AEWC villages have landed 399 bowhead whales, or an average of 39.9 whales per year. As shown in Table 3.5-1, the largest AEWC community of Barrow takes over half of the total, with an average of 23.4 bowhead whales landed per year in the last decade. Most of the rest of the communities take one to three whales per years, while the small communities of Wales, Pt. Lay, and Little Diomede have highly intermittent harvests, and Kivalina has taken no whales in this period.

Table 3.5-1
Bowhead Whales Landed 2001 - 2010

	Gambell	Savoonga	Wales	Little Diomede	Kivalina	Point Hope	Point Lay	Wainwright	Barrow	Nuiqsut	Kaktovik	Total
Total Landed	23	33	1	1	0	26	1	32	219	32	31	399
Annual Ave.	2.3	3.3	0.1	0.1	0	2.6	0.1	3.2	21.9	3.2	3.1	39.9

Source: AEWC and NSB, 2010

Bowhead whales provide exceptionally large quantities of 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 Barrow, the authors established the average pounds of food produced per foot of length for small, medium, and large bowhead whales. As shown in Table 3.5-2, using the detailed data on length of harvested whales, the 1993 method was applied to derive an estimate that approximately one million pounds of bowhead whale *maktak* and meat was produced annually over the past decade. However, a benchmark estimate can be constructed to suggest how much food might be available. The 2010 Census figures for the population of the AEWC villages (noted in Section 3.4), represent the population at approximately the end of the period under consideration. For this population, the estimated total harvest would represent an annual harvest level of 118.5 pounds per capita, if the total population is counted, or 146.6 pounds per capita if the Alaska Native population is taken as the basis of the calculation. Since a considerable quantity of bowhead food is shared with kin group members and friends outside of the AEWC communities, the figures developed would tend to overestimate the per capita rate. In addition, it is important to keep in mind that this is a mathematical estimate only, and not a documented rate of food received by each household.

Table 3.5-2
Estimated Edible Pounds of Bowhead Whale 2001 - 2010

	Number Taken	Total Edible Pounds	Average Annual Edible Pounds
Small whales (20 - 34 ft.)	221	3,076,389	307,638
Medium whales (35 - 45 ft.)	96	3,105,390	310,539
Large whales (46 - 63 ft.)	75	3,607,885	360,788
Total	392	9,789,665	978,966

Source: AEWC and NSB, 2010

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 more detailed perspective on 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. 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 200 pounds per capita in several communities, and no bowhead harvest in Kivalina in 2007 or Point Lay in 1987.

Total subsistence production levels also varies among the communities, with the more heterogeneous community of Barrow having the lowest annual per capita total at 289 pounds, while the other ranged from 487 pounds to 890 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, surveyed in 2007, 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, AEWC communities averaged 28.6 bowheads whales landed per year, whereas in the past decade the average has been 40 bowhead whales landed per year, an increase of approximately 39.8 percent. This difference between comprehensive household survey data and current bowhead harvest levels is even more important for Barrow, with average harvests of 13.7 whales per year in the period 1987 - 1993, compared to an average annual take of 21.9 whales per year in the past decade, an increase of 60 percent.

Table 3.5-3
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 1989	125.21	43.29	71.18	39.28	9.76	0.44	289.16
Kaktovik 1992	560.35	38.78	148.71	118.91	16.83	1.18	884.76
Kivalina 2007	0	291.2	90.2	183.2	10.2	18.7	593.7
Nuiqsut 1993	213	23.02	242.03	250.62	11.98	1.1	741.75
Point Hope 1992	33.60	354.1	37.49	43.83	13.63	4	487
Point Lay 1987	0	637.41	177.71	24.74	48.40	1.85	890.11
Wainwright 1989	218.23	302.27	178.18	37.15	15.41	ND	751.24
Wales 1993	188.19	392.14	25.53	121.99	11.62	4.69	744.16

Source: ADF&G 1987,1989,1992,1993, 2007; 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 3.5-4, the communities of Kaktovik, Barrow, 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 3.5-4
Proportion of Subsistence Food Provided by Various Species Groups

Village	Bowhead whale	Other marine mammals	Game	Fish & marine invertebrates	Birds & eggs	Vegetation	Total Percent
Barrow 1989	43.3%	15.0%	24.6%	13.6%	3.4%	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 1993	28.7%	3.1%	32.6%	33.8%	1.6%	0.1%	100.0%
Point Hope 1992	6.9%	72.7%	7.7%	9%	2.8%	0.1%	100.0%
Point Lay 1987	0%	71.6%	19.9%	2.8%	5.4%	0.2%	100.0%
Wainwright 1989	29.0%	40.2%	23.7%	4.9%	2.1%	ND	100.0%
Wales 1993	25.3%	52.7%	3.4%	16.4%	1.6%	0.6%	100.0%

Source: ADF&G 1987,1989,1992,1993, 2007; 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 3.5-5, for the five smaller communities with data, 74% - 97% 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 (4.8%-21.2%) has actually harvested bowhead whales in the study years. For the larger communities of Barrow and Wainwright, the available data are more limited, demonstrating that 45%-66% of household are involved in harvesting. If sharing and use data were available, it is likely that these two communities would also show extremely high proportions of households using bowhead whale foods. More detailed accounts of the subsistence harvest patterns of Kaktovik, Nuiqsut, 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 Barrow, Nuiqsut, and Kaktovik.

Table 3.5-5
Rates of Participation in Bowhead Subsistence Activities

	Percentage of Households				
	Using	Trying to Harvest	Harvesting	Receiving	Giving
Barrow 1989	n/a	n/a	45.0	n/a	n/a
Kaktovik 1992	87.2	53.2	6.4	85.1	61.7
Kivalina 2007	64.3	47.6	n/a	64.3	16.7
Nuiqsut 1993	96.8	37.1	4.8	96.8	75.8
Pt. Lay 1987	87.5	21.2	21.2	84.4	21.2
Wainwright 1989	n/a	n/a	66.0	n/a	n/a
Wales 1993	73.8	26.2	11.9	64.3	40.5

Source: ADF&G, 2001d, 2007 N/A = not available

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 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 take bowhead in the fall migration, continuing as late as December.

AEWC residents 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 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 for harvests in necessary. At times, those participating in the harvest reported that 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 Barrow, Nuiqsut, and Kaktovik, see Braund (2010).

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 crew members 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 Barrow for the spring hunts due to their 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). Hauling a whale onto the ice edge and processing the enormous amount of food provided required the cooperative labor of virtually the entire community.

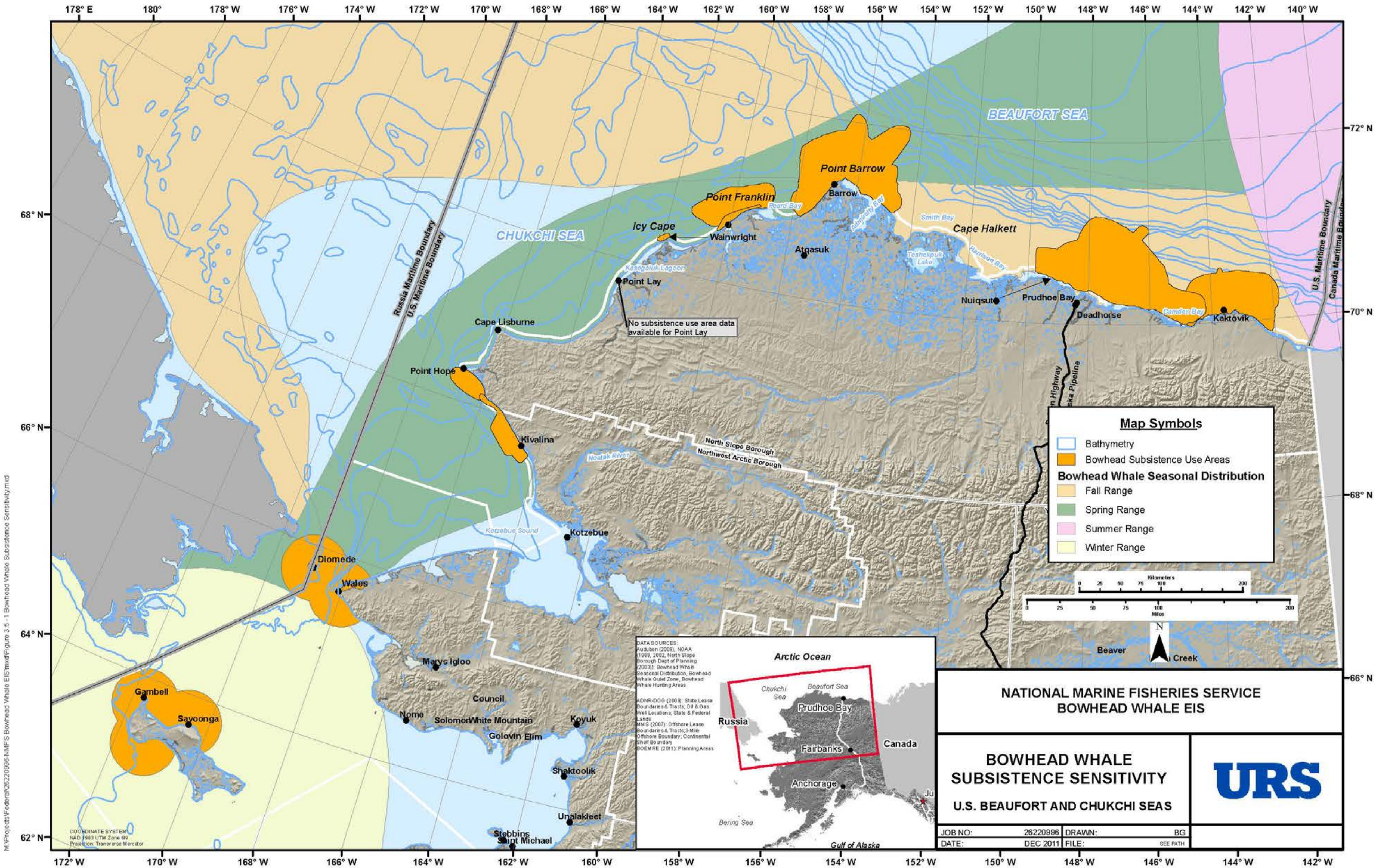

Figure 3.5-1 Bowhead whale subsistence sensitivity. U.S. Beaufort and Chukchi seas. 2011.

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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 craft work. 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., personal communication, 2007; Dorcus Stein, personal communication, 2007). The whaling captains retain half of the baleen and bone, and distribute the remainder to the whaling crew. Captains and crew members 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 the National Oceanic and Atmospheric Administration (NOAA) and the AEWC. The IWC has determined catch limits for bowhead whale harvests, after considering the nutritional and cultural need for bowhead whales by Alaska Eskimos and the level of harvest that is sustainable. In 1986, the IWC accepted a method to calculate subsistence and cultural need of Alaska Eskimos for bowhead whales. This method incorporates the historic and current size of the Eskimo population residing in Alaskan subsistence hunting villages and the number of bowhead whales historically landed by each community. For the current AEWC study regarding the subsistence and cultural need, see Appendix 8.1. Because bowhead subsistence hunts are a community-wide activity, it is appropriate to consider the community population in association with the historic harvest levels. Besides abundance of bowhead whales, community population levels are a critical factor that influences harvests because the community population dictates the number and size of subsistence hunt crews and the amount of meat and *maktak* needed to feed the community, share with others, and provide for annual celebrations (Braund et al., 1997).

The first calculation of nutritional and cultural need was submitted to the IWC in 1983 and was accepted by the IWC in 1986 (U.S. Government, 1983). Using the same method for calculating need, the second calculation was submitted to and accepted by the IWC in 1988, when more extensive research provided additional historical subsistence hunting and human population data. The 1988 study used the most recent Eskimo population data available at that time, ranging from 1983 - 1987, to calculate then-current need (Braund et al., 1988). The third calculation of need was submitted to and accepted by the IWC in 1994, based on July 1, 1992 human population data generated by the State of Alaska, Department of Labor. The fourth calculation, submitted to the IWC in 1997, used the same method accepted by the IWC in 1986 for calculating need, 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 same calculation was 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. The 2007 calculation of subsistence need was submitted to the IWC, based on 2000 census data. This statement documented a subsistence and cultural need for 57 landed bowhead whales per year.

3.5.1 Methodology of Eskimo Subsistence Hunt

The hunting of bowhead whales by Alaska Eskimos 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). Crew sizes currently average six persons per vessel (Rexford, 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 Eskimos 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 harpoon with line and float attached is always used first since it is the forward part of the darting gun. Once the darting gun is thrown, the shoulder gun is almost always used as a back-up.

Contemporary hunts occur twice a year in the spring and autumn seasons based on ice and weather conditions. 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 quieter and therefore more effective in the ice leads.

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, and lighting (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, where the skin and blubber, known as *maktak*, are either eaten raw or boiled in salted water (Ellis, 1991). Subsistence foods also include muscle, tongue, 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 art work (Craig George, North Slope Borough, personal communication, December 20, 2007).

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)[9]. In the IWC meeting held in St. Helier, Jersey, Channel Islands (U.K.) in July 2011, the AEWC prepared, and the U.S. submitted to the Subcommittee a Report of the Working Group on Whale Killing Methods and Associated Welfare Issues (AEWC and U.S. Government, 2011). The member governments provided

[9] The efficiency of the hunt is also expected to improve as a result of the passage of an emergency towing assistance provision contained in section 403 of the Hydrographic Services Improvement Act Amendments of 2002. Pub. L. 107-372.

reports that summarized data on whales killed, information on improving the humaneness of whaling operations, whale welfare and ethics workshops, and welfare issues associated with the entanglement of large whales. Norway showed "substantial improvements since the first research when cold harpoons were used (17% instant deaths and mean time to death over 11 minutes) compared to the 2000 - 2002 results using the new penthrite grenade (instant deaths at least 80% and mean time to death about 2 minutes)."

According to the IWC summary, the United States reported that:

> In 2010, 71 bowhead whales were struck and 45 animals were landed. While the number landed was higher than the recent 10 year average (39), the efficiency (% of struck whales landed) was 63%, which is lower than the 15 year average of 77%.
>
> In 1979, the AEWC committed to the IWC to work to achieve an average efficiency of 75%. In practice, despite great efforts, efficiency in this subsistence hunt will be highly variable (and less than 100%) as this reflects the variability in two of the most important factors affecting the hunters' ability to retrieve whales once they are struck i.e. ice and weather conditions. Ocean currents and the whale's momentum also can carry whales under the shore-fast ice, making it impossible for them to be retrieved. In 2010 a number of struck whales sank but did not resurface; the cause is unknown.
>
> Equipment failure can also contribute to losses. This year, the AEWC identified a problem with some newer harpoons in Barrow and steps are being taken to correct this. The USA is committed to improving the hunt, including the introduction of the penthrite grenade that results in quicker kills. This involves not only distribution of the grenades but importantly training and certification of hunters. At this time, penthrite grenades are available in Barrow, Wainwright, Nuiqsut, Gambell, Savoonga, Point Lay and Kaktovik and almost all of the hunters have completed training and certification. Results from 2010 and the 2011 spring hunt are being collated and are very promising with a high percentage of instant kills.
>
> However, the penthrite programme [sic] is expensive. Not only is the cost of the projectile expensive (more than $1,000) but transportation can also be extremely expensive (e.g. $30,000 to ship 90 grenades to St. Lawrence Island from Barrow by charter). The AEWC is working with the US Coast Guard to try to avoid some of the charter costs (IWC, 2011c).

3.5.2 Results of Recent Hunts

Suydam and George (2004) summarize Alaskan subsistence harvests of bowheads from 1974 to 2003. Hunters landed a total of 832 whales during this time period. Subsequently, the number of bowheads landed by Alaska Natives was reported as 37 in 2004 (Suydam et al., 2005; 2006), 55 in 2005 (Suydam et al., 2006), 31 in 2006 (Suydam et al., 2007), 41 in 2007 (Suydam et al., 2008), 38 in 2008 (Suydam et al., 2009), and 31 in 2009 (Suydam et al., 2010), and 45 in 2010 (Suydam et al., 2011). Barrow consistently landed the most whales (n = 572) while Little Diomede landed two (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. 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 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 quota in 1978. Before 1978 the efficiency was about 50%; in the last ten years efficiency has averaged 77% (Figure 3.5.2-2) (Suydam et al., 2011). In 2010, the rate declined to 63%. In an analysis of the 2010 hunt provided to the IWC, the factors affecting efficiency were described as follows:

> The increase [in efficiency after the mid-1970s] was due to many factors including enhanced communication (i.e., improved marine radio capabilities) among hunting crews, training of younger hunters, and improved weaponry (Suydam et al., 2011).

The decline in harvest efficiency in 2010 was considered an anomaly, and could be attributed to difficult environmental conditions in the spring of 2010, including ice conditions, struck whales escaping under the shorefast ice, and equipment failures. 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).

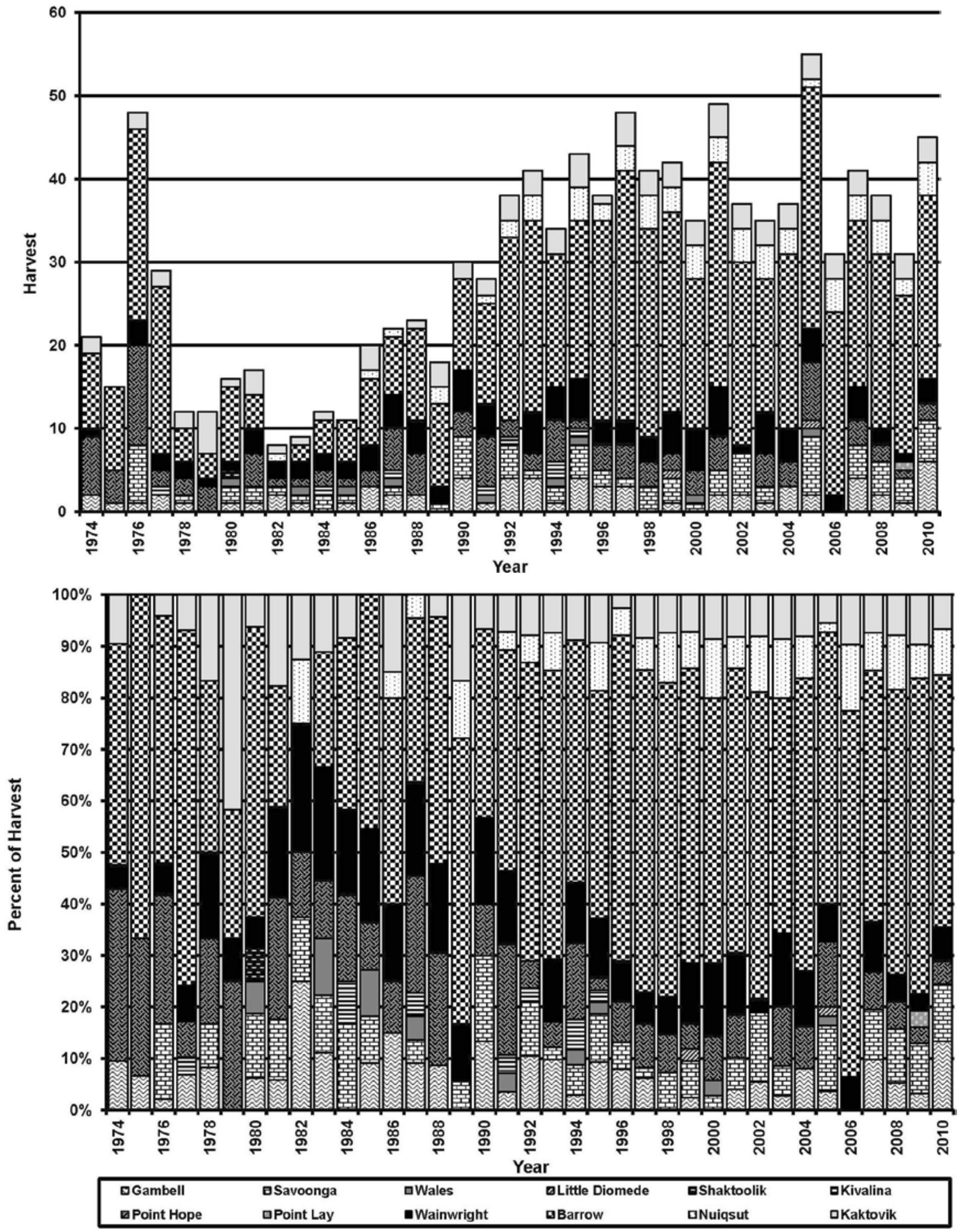

Figure 3.5.2-1 Number (a) and cumulative percent (b) of Western Arctic bowhead whales landed by Eskimo villages in Alaska, 1974-2010 (from AEWC and NSB, 2011).

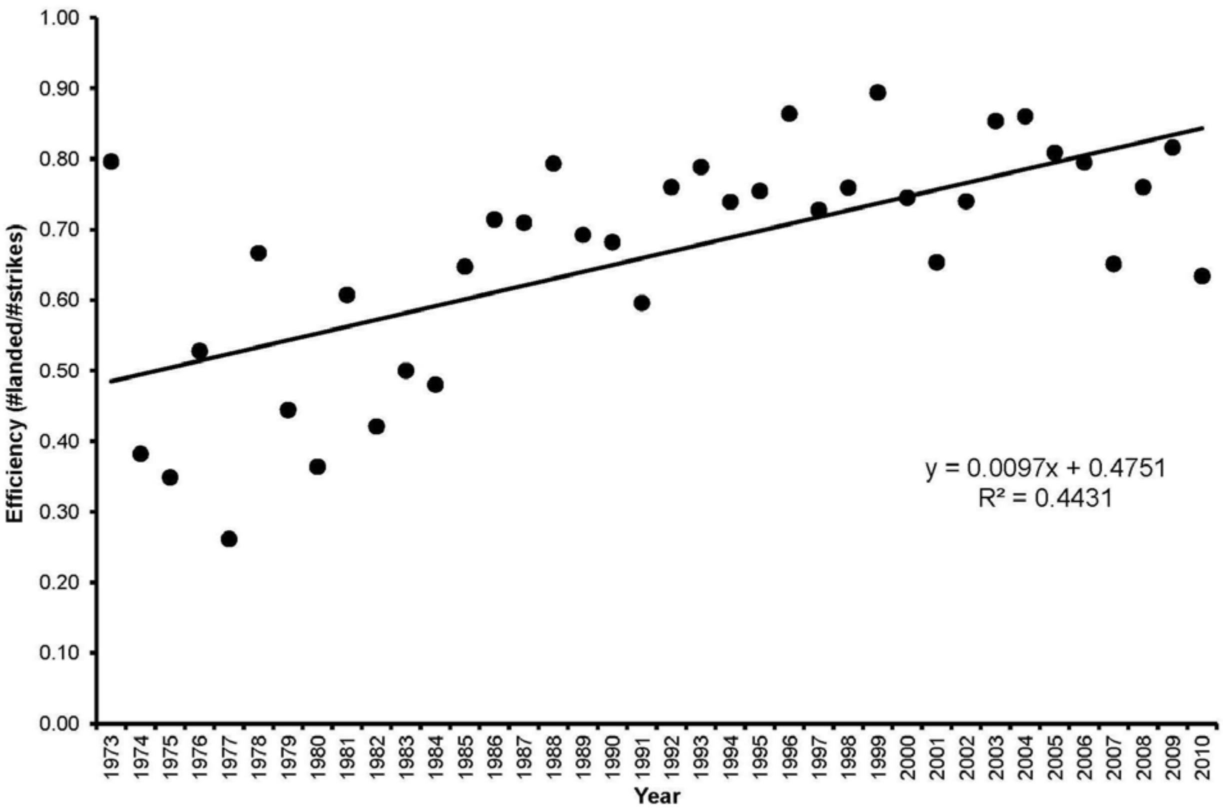

Figure 3.5.2-2 Efficiency of the Western Arctic bowhead whale subsistence hunt, 1973-2010 (from AEWC and NSB, 2011.

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 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, 2004). Villages along the western coast of Alaska harvest bowhead whales primarily during the spring migration (Figure 3.5.2-3), 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 (Figure 3.5.2-3). Overall, the sex ratio of the harvest has been equal.

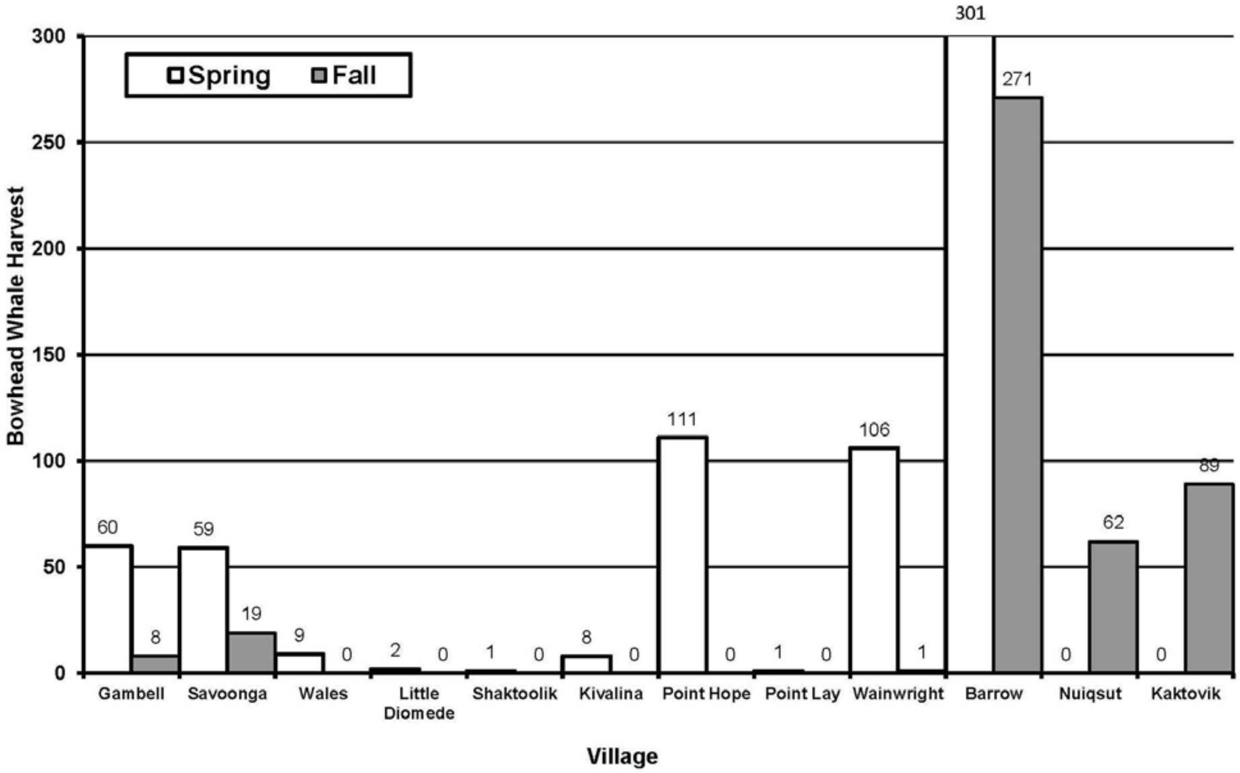

Figure 3.5.2-3 Western Arctic bowhead whale harvest by season for each Eskimo village in Alaska, 1974-2010 (from AEWC and NSB, 2011).

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 whale and the Eskimo culture, to promote scientific investigation of the bowhead whale, and to effectuate the other purposes of the Whaling Convention Act (WCA), the MMPA, and the ESA, as these 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[10].

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 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 Agreement. If AEWC fails to carry out its responsibilities, NOAA may assert its federal management and enforcement

[10] NOAA and AEWC are signatories to the Cooperative Agreement. However, NMFS has been delegated the responsibility for implementation.

authority to regulate the hunt after notifying the AEWC of its intent, and providing an opportunity to the AEWC to discuss the proposed action. 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 (subsection 100.1). 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 (subsection 100.11(b)). 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, and initiates research to improve the accuracy and reliability of weapons used to hunt bowhead whales (subsection 100.12).

3.6.2 Quota Distribution among Villages

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

3.6.3 Monitoring and Enforcement of Hunting Regulations

Reports of each hunt must include the date, place, time of strike, size, and type of 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. Violators, after opportunity for a hearing before the AEWC, 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 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 willingness to intervene with whaling captains to enforce the quota and other provisions. Langdon (1984:51) refers to examples from 1981 and 1982, while Freeman (1989:151) describes a 1985 incident. More recently, on approximately May 25, 2003, a female bowhead whale was taken in the Beaufort Sea near Barrow, Alaska, by the crew of an AEWC registered bowhead subsistence captain. On taking the whale, the crew realized it was accompanied by a calf, which then swam away. The U.S. elected to report two infractions to the IWC as the disposition of the calf was unknown (IWC, 2005b). The taking of a whale calf or a cow accompanied by a calf is prohibited by Alaska Eskimo hunting tradition, by the AEWC management plan for the bowhead subsistence hunt, the WCA regulations, and by the IWC Schedule. The AEWC considers the taking of a whale calf or a cow with a calf to be a very serious infraction. On May 30, 2003, the commissioners of the AEWC convened a hearing to receive testimony from the members of the crew and from the members of other crews who were in the vicinity when the whale was taken. While testimony indicated that the taking might have been accidental, the commissioners concluded that the crew knew a cow/calf pair was in the vicinity and did not act with proper caution under the circumstances. Therefore, the commissioners voted to rescind the bowhead subsistence captain's registration with the AEWC for two years (four seasons) beginning with the autumn 2003 bowhead subsistence hunt. The AEWC also confiscated the baleen taken from the whale and donated it to a local organization that supports Native artists. Under the WCA, it is illegal for anyone who is not a registered captain with the AEWC, or a member of the crew of a registered captain, to hunt bowhead whales. Anyone attempting to take a bowhead whale without being properly registered with the AEWC, or being a crew member of a registered captain, is subject to penalties under U.S. law.

Another calf taking occurred during the fall 2006 hunt, Whale ID 06B10, September 29, 2006 (Male, 6.3 m), Barrow. This whale was landed and then deemed to be a calf. It had milk in its stomach and very short baleen (Suydam et al., 2007). On November 16, 2006, the commissioners of the AEWC convened a hearing on this incident. After receiving testimony from the members of the crew and other crews in the area when the whale was taken, the commissioners determined that this taking was an accident resulting from the fact that no cow was seen in the vicinity and the animal was large for a nursing calf.

The smallest female landed during the fall 2007 hunt (Whale ID 07B18, October 9, 2007) was most likely a calf based on standard length, baleen length and other characteristics. The whale did not have milk in her stomach, but her baleen was 29 cm long (Suydam et al., 2008). A bowhead that is less than 7.5 m in length and baleen less than 60 cm is typical of a calf (George and Suydam, 2006). The animal was swimming alone in the eastern Chukchi Sea near Barrow. After an investigation by the AEWC, it was determined that hunters mistakenly harvested the calf thinking it was a small, independent whale. Autumn calves are close in body length to yearlings and it is difficult to determine their status when swimming alone (IWC, 2008).

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, 2009).

Hunters mistakenly harvested two female calves thinking they were small, independent whales during the Fall 2009 hunt (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 Barrow (09B11) was also short (7.2 m) but its baleen was 72 cm long, suggesting it was not a calf (Suydam et al., 2010).

Two whales harvested during the 2010 hunt were 7.3 m in length (Suydam et al., 2011), but neither was identified as a calf. Both were taken at Barrow, one during the spring hunt (Whale ID 10B8, male) the other during the fall hunt (Whale ID 10B22, female).

3.6.4 Reporting requirements to NOAA and IWC

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 then reports to the AEWC central office in Barrow. The AEWC office takes a report which is passed on to the NMFS office in Anchorage. After completion of the whaling season, the AEWC office submits a final report to the U.S. Department of Commerce, NOAA office in Washington, D.C. According to the 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 report is due to NOAA within 30 days after the conclusion of the whaling season.

4.0 ENVIRONMENTAL CONSEQUENCES

4.1 Methodology

This chapter describes the predicted direct, indirect, and cumulative effects on the biological and human environment from implementing the alternatives described in Chapter 2. The chapter begins by summarizing the methodology used to predict environmental consequences, including: frequently used terms (Section 4.1.1); the steps and criteria used for determining the level of impact (Section 4.1.2); and an overview of the approach to cumulative effects assessment (Section 4.1.3). Section 4.2 explains how incomplete or unavailable information is dealt with in this document, and Section 4.3 identifies resources not carried forward for further analysis. Sections 4.4 and 4.5 analyze direct and indirect impacts to the Western Arctic bowhead whale stock and individual bowhead whales, respectively, from each of the alternatives, while Section 4.6 discusses the cumulative impacts to the Western Arctic bowhead whale stock. Sections 4.7 and 4.8 discuss the analyses of the direct, indirect, and cumulative impacts to other wildlife and the sociocultural environment, respectively. Section 4.9 summarizes the biological and sociocultural effects.

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 Code of Federal Regulations [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). Environmental Impact Statements (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 Council on Environmental Quality (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). PBR is defined in 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." According to the most recent National Marine Fisheries Service (NMFS) stock assessment, the PBR for the Western Arctic stock of bowhead whales is 95 animals per year (Allen and Angliss, 2011).

PBR was originally intended as a measure of impact from commercial fisheries, and should not be used as a means of evaluating or limiting subsistence harvest. The subsistence harvest 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. A conservative approach to setting the harvest limit is to use the values of the catch control rule Q from the 2006 stock assessment (see Section 3.2.1 for the introductory discussion of the catch control rule Q), which range from a low bound of 155 whales per year to a high bound of 412, with a best estimate value of 256 (Brandon and Wade, 2006). The 2006 Q values will also be used as thresholds for determining the level of impact on the bowhead whale population in this EIS. Recognizing that there is some uncertainty (Q is based on probability estimates) in the Q values, this assessment will employ the lower bound of Q at 155 whales, termed Q_{low} and the best estimate of Q at 257 whales, termed $Q_{best,}$ and the high bound of Q at 412 whales, termed $Q_{high,}$ as impact threshold levels.

A take that is below Q_{low} (155 whales per year) is considered a negligible impact. A take that is between Q_{low} (155 whales) and Q_{best} (256 whales) would be considered a minor impact. A take that is between Q_{best} (257 whales) and Q_{high} (412 whales) would be considered a moderate impact. A take greater than Q_{high} (412 whales) would be considered a major impact. The impact criteria are summarized in Table 4.1-1.

For wildlife species other than bowhead whales, the magnitude of effects on population 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 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 nonbiological 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. "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. “Moderate” is somewhere in between. “Intermittent or infrequent” effects are those that occur twice a year or less. "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%. 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 determined catch limits for bowhead whale harvests, after considering the nutritional and cultural need for bowhead whales by Alaska Eskimos and Russian Natives, and the level of harvest that is sustainable. In 1986, the IWC accepted a method to calculate subsistence and cultural need of Alaska Eskimos for bowhead whales. This method incorporates the historic and current size of the Eskimo 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 the five year block catch limits for this stock in 1997, allowing a total of 280 bowhead whales to be landed, or an average of 56 whales per year. Suitability of the strike limits is determined using the Bowhead Strike Limit Algorithm (SLA) program (IWC, 2005a). Inputs include bowhead whale catches, abundance estimates from 1978 - 2001, and the value of need (i.e., 67 whales multiplied by the number of years of the quota). In 2004, the results of the Bowhead SLA calculations showed “that this level of need can be satisfied while fully meeting the Commissioner’s management objectives” (IWC, 2005a:23). For the proposed 2013 through 2017 quota or 2013 through 2018 quota (Alternative 3A and Alternative 3B), annual strike limits would be established at 67 bowhead whales struck, with an allowance for the carry-over of up to 15 unused strikes from any previous year (including 15 unused strikes from the 2008 through 2012 block quota).

The IWC has sanctioned the aboriginal harvest of whales from this stock by both the United States (U.S.) and the Russian Federation. Annual strike limits and quotas for bowhead whales are determined at the beginning of 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 quota between the two countries. Of the quota, the

U.S. and the Russian Federation have agreed on a suballocation of five whales 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 thresholds for mortality effects are established in relation to the IWC Scientific Committee catch control rule Q, as described in Section 4.1.2. 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-over 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-over.

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	Total mortality assessment less than or equal to Q_{low} (less than 155 annually, or 775 for five years)	Total mortality assessment between Q_{low} and Q_{best} (155 - 257 annually, or 775 - 1285 for five years)	Total mortality assessment between Q_{best} and Q_{high} (257 - 412 annually, or 1285 - 2060 for five years)	Total mortality assessment equal to or greater than Q_{high} (greater than 412 annually or 2,060 for five years)
	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 summarizes 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
Mortality	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 Frequency	No measurable effects	Periodic, temporary, or short-term	Moderately frequent or intermittent	Chronic and 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 EIS, assessment of cumulative effects requires an analysis of the direct and indirect effects of the proposed harvest quota 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 harvest quota 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 harvest quota alternatives.

The methodology used for cumulative effects analysis in this EIS is drawn from the 2008 EIS on the Alaska Eskimo Subsistence Hunt on Bowhead Whales. This was based on the methodology used in many NMFS NEPA documents including the recent EIS concerning oil and gas development activity in the Beaufort and Chukchi seas (NMFS 2011). It consists of 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 Chapter 3.
- *Describe the direct and indirect effects of the harvest quota alternatives*. This information is presented in Chapter 4.
- *Define the spatial (geographic) and temporal (time) frame for the analysis*. The reasonably foreseeable future has been established as the next 10 years (through 2022 for the purposes of this EIS.
- *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 EIS, 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.

The past actions applicable to the cumulative effects analysis have been either presented in Chapter 3 or previously reviewed in recent environmental reviews, including the following documents:

(1) Draft Environmental Impact Statement – Beaufort and Chukchi Sea Planning Areas Oil and Gas Lease Sales 209, 212, 217, and 221, (Minerals Management Service [MMS], 2008);
(2) Environmental Assessment — Shell Offshore Inc., Beaufort Sea Exploration Plan (EP), 2007-2009 (MMS, 2007b);
(3) 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);
(4) Final Supplemental Environmental Impact Statement - Chukchi Sea Planning Area, Oil and Gas Lease Sale 193 (BOEMRE, 2011a);
(5) Draft Environmental Impact Statement - Outer Continental Shelf Oil and Gas Leasing Program: 2012- 2017 (BOEM, 2011);
(6) Draft Environmental Impact Statement – Effects of Oil and Gas Activities in the Arctic Oceans (NMFS, 2011); and
(7) Point Thomson Project Draft Environmental Impact Statement. US Army Corps of Engineers (USACE, 2011).

The cumulative effects analysis relies heavily 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.

4.1.3.2 Reasonably Foreseeable Future Actions (RFFAs)

RFFAs are those that 1) 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; 2) are included as priorities in government planning documents; or 3) 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 EIS. Due to the large geographic scope dealt with in this analysis, the identification of RFFAs was conducted on a broad scale although 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 Chapter 3. Subsistence harvests of other animals are likely to continue at present levels also.
- *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.
- *Industrial pollutants:* Oil pollution in the marine environment 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).
- *Commercial fisheries:* Federal and state fisheries operate according to the designated Fishery Management Plan (FMP). State regulated 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 groundfish in the U.S. Exclusive Economic Zone (EEZ) off Alaska and ABF manages fisheries in nearshore waters as well as the offshore crab fisheries.
- *Commercial shipping:* It is anticipated that commercial shipping will increase in the future as northern Alaskan ports become ice-free for longer periods throughout the year, as onshore and offshore areas are developed for oil and gas, and as local communities grow.
- *Other economic and community 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.
- *Scientific research:* Activities related to the scientific research of the physical environment, bowhead whales specifically, other marine mammals, fish, birds, and marine predator-prey relationships are likely to continue.
- *Climate variability:* Short-term changes in the ocean climate are likely to continue on a scale similar to those presently occurring, as described in Chapter 3. Evidence is emerging that human-induced global climate change is linked to the warming of air and ocean temperatures and shifts in global and regional weather patterns.
- *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.

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

	Past and Present	Reference (within this EIS)	Reasonably Foreseeable
Human-Caused Activities			
Subsistence activities	▪ Harvest of marine and terrestrial mammals, fish, and birds	Sections 1.1.4, 1.2, 2.1, 2.2, 2.3, 2.4, 3.2.4, 3.4, 3.5, 4.8	▪ Harvest of marine and terrestrial mammals, fish, and birds
Commercial harvest	▪ Commercial whaling	Section 3.2.3	▪ None
Oil and gas activities	▪ Seismic exploration ▪ Offshore drilling and production ▪ Industrial noise	Sections 3.2.8, 4.6.1	▪ Seismic exploration ▪ Offshore exploration and development ▪ Construction and maintenance of oil and gas facilities ▪ Associated transportation activities (barging, pipelines, aircraft and vessel traffic) ▪ Industrial noise
Industrial pollutants	▪ Marine spills and pollution ▪ Marine debris ▪ Bioaccumulation ▪ Human health	Sections 3.2.8, 4.6, 4.8.1	▪ Marine spills and pollution ▪ Marine debris ▪ Bioaccumulation ▪ Human health
Commercial fisheries	▪ Crab fishery (entanglement in gear) ▪ Ship strikes	Sections 3.2.7, 4.6.3	▪ Crab fishery (entanglement in gear) ▪ Ship strikes
Commercial shipping	▪ Barge/vessel traffic and fuel spills ▪ Ship strikes ▪ Aircraft traffic	Section 4.6.3	▪ Barge/vessel traffic and fuel spills ▪ Ship strikes ▪ Aircraft traffic
Other development	▪ Military activity ▪ Coastal and infrastructure development ▪ Tourism	Section 4.6	▪ Military activity ▪ Coastal and infrastructure development ▪ Tourism
Scientific research	▪ Biological ▪ Oceanographic ▪ Geophysical/chemical (see oil and gas development)	Section 4.6.4	▪ Biological ▪ Oceanographic ▪ Geophysical/chemical (see oil and gas development)
Natural Systems			
Climate variability	▪ Global warming	Section 4.6.2	▪ Global warming
Mortality	▪ Predation ▪ Disease and parasites	Sections 1.1.3, 3.2.5, 3.2.7, 4.4, 4.5, 4.6	▪ 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 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 time frame 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 time frame 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 EIS 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 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 Stock

Alternatives were developed based on the IWC recommended strike limit (including takes in both Alaska and the Russian Federation). The action alternatives primarily assess the merits of different options in the carry-over strikes without suggesting a change to the existing catch limits provided through the international forum of the IWC, and as established through several decades of scientific research and calculations. In the analysis of impacts under the alternatives, the risk of mortality is estimated based on the strike limits, rather than the quota 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.

4.4.1 Alternative 1 (No Action)

Alternative 1 would eliminate a quota for subsistence taking of bowhead whales and might result in the elimination of subsistence whaling activities and harvest. No bowhead whales would be taken in subsistence harvests. Therefore, the magnitude, extent, and duration of direct mortality under this alternative are considered negligible to the population of bowheads (as per 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. 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).

4.4.2 Alternative 2A

Alternative 2A would authorize a maximum annual mortality (or strikes) of 67 bowheads for a five year period, subject to a total of 255 landed whales over five years. Over the five year period the total mortality could be 5 x 67 or 335 whales. The total mortality would be lower if all struck whales were landed because of the limit on landed whales. The total annual mortality assessment under this alternative is 67 whales per year which, given the current abundance and growth trends (Section 3.2.1), is unlikely to cause the population to decline or to slow its rate of recovery. This maximum annual mortality of 67 bowhead whales would be 43% of the Q_{low} value of 155 whales per year, which is rate of harvest at which population growth may be impeded. The magnitude, geographic extent, and duration 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 2A 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. Disturbance to the whales from subsistence whaling activities under Alternative 2A would be localized and short-term and would be considered minor at the population level.

4.4.3 Alternative 2B

Alternative 2B would authorize a maximum annual mortality (or strikes) of 67 bowheads for a six year period, subject to a total of 306 landed whales over six years. The six year total mortality (or strikes) could reach 6 x 67 or 402 whales. If all struck whales are landed, the total mortality would be lower due to the limit on the number of whales landed. The direct and indirect effects of Alternative 2B on the bowhead whale population would be nearly identical to Alternative 2A since the annual strike quota remains the same, but would extend for one additional year through 2018. The magnitude, geographic extent, and duration of this level of mortality are considered negligible for the bowhead population, and disturbance to the whales from subsistence whaling activities under Alternative 2B would be localized and short-term and considered minor at the population level.

4.4.4 Alternative 3A

Alternative 3A would authorize a maximum mortality (strikes) of up to 82 bowheads in a year, if the authorized carry-over of 15 unused strikes were to occur, subject to a total of 255 landed whales over five years. Over the five year period the total mortality could be 350 whales (5 x 67, plus 15 carried over) or an average of 70 bowhead whales per year. This maximum annual mortality of 82 bowhead whales would be 56% of the Q_{low} value of 155 whales per year, which is rate of harvest at which population growth may be impeded. 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 2A, so the overall impact is rated negligible. The effects of human activities associated with subsistence whaling under Alternative 3A would be similar to those described for Alternative 2A, with disturbance at a minor impact level.

4.4.5 Alternative 3B (Preferred Alternative)

Alternative 3B would authorize a maximum mortality (strikes) of up to 82 bowheads in a given year, if the authorized carry-over of 15 unused strikes were to occur, subject to a total of 306 landed whales over six years. Over the six year period the total mortality could be 417 whales (6x67, plus 15 carried over) or an average of 70 bowhead whales per year. The direct and indirect effects of Alternative 3B on the bowhead whale population would be nearly identical to Alternative 3A; the annual strike quota remains the same, but would extend for one additional year through 2018. The overall impact of Alternative 3B is, therefore, considered negligible at the population level. The disturbance effects of human activities associated with subsistence whaling under Alternative 3B would be considered minor.

4.5 Direct and Indirect Effects of the Alternatives on Individual Whales

In addition to mortality if struck or landed, under the action alternatives, hunting activities have the potential to indirectly affect bowhead whales that are not being pursued. This includes the presence of vessels and underwater noise. The sound of one or more harpoon bomb detonations during a strike is audible for some distance. Acousticians listening to bowhead whale calls as part of the census report that calling rates decrease precipitously after a detonation (C. W. Clark, Cornell Laboratory of Ornithology, personal communication). 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, personal communication). 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, personal communication). These changes in migratory behavior in response to disturbance are short-term, as several whales are often landed at whaling villages such as 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 under Alternative 1, since under this alternative no subsistence whaling would occur. Under Alternatives 2A, 2B, 3A, and 3B, subsistence whaling would occur, and as described in the effects analysis in Section 4.4, the magnitude, extent, and duration of the associated disturbance effects would also be minor for individual bowhead whales.

4.6 Cumulative Effects of the Alternatives on the Western Arctic Bowhead Whale Stock

Cumulative effects are assessed by aggregating the potential direct and indirect effects of the project with the impacts of past, present, and reasonably foreseeable future actions in the project area. The ultimate goal of identifying potential 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 block quota for the subsistence harvest of bowhead whales. The following sections discuss past, present, and reasonably foreseeable future activities occurring in the vicinity of the project that have the potential to affect bowhead whales. Subsequent sections address the direct, indirect and cumulative effects on other wildlife (Section 4.7), and direct, indirect and cumulative sociocultural effects (Section 4.8).

4.6.1 Offshore Oil and Gas Activities

4.6.1.1 Past and Present Oil and Gas Activities

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 EIS project area; construction and ongoing maintenance of present infrastructure support facilities and transportation systems; and any other oil and gas activities that affect the EIS project area and are currently underway. These activities include projects or actions that may occur in a broader geographic area than the EIS project area, including projects in any stage of development.

Oil and gas development is a primary agent of industrial-related change within the project area. Although oil from seepages was used as fuel by Iñupiat people prior to western contact, the first modern program of oil and gas exploration on the North Slope was conducted by the U.S. Navy and the U.S. Geological Survey (USGS) during the 1940s and 1950s. 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, as well as the more recently discovered Liberty field, are located mostly in the offshore area, but their production facilities are located onshore (MMS, 2008). Several additional developments including Eider, Northstar, and Oooguruk operate in nearshore areas of the Beaufort Sea. TAPS throughput peaked in 1988, at nearly 2.1 million barrels per day, and has since declined to about 630,000 barrels per day in 2011 (Alyeska Pipeline Service Company, 2011). Currently there are 35 fields and satellites producing oil on the North Slope and in nearshore areas of the Beaufort Sea. Additional discoveries are under development.

Ongoing activities resulting from federal leases in the Beaufort and Chukchi seas program areas, as well as State of Alaska leases in the nearshore zone of the Beaufort Sea, are considered in the cumulative case. There are currently no State of Alaska leases in the nearshore zone of the Chukchi Sea. However, numerous oil and gas leases are currently active in state waters of the Beaufort Sea (see Figure 4.6.1.1-1).

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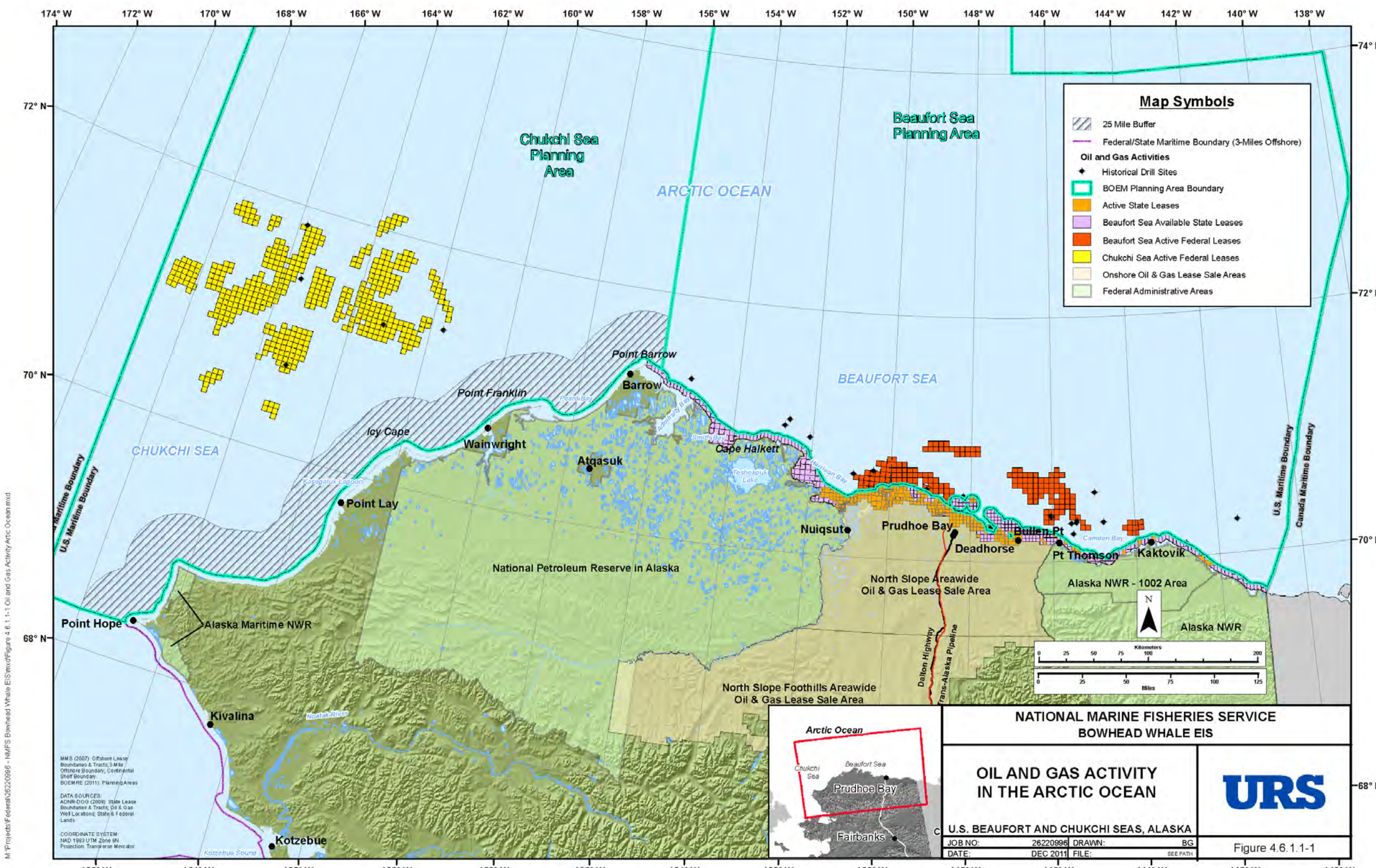

Figure 4.6.1.1-1 Offshore North Slope Oil and Gas Lease Areas

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Fifteen state and federal planning areas make up the Alaska Region for oil and gas exploration. For additional information on past, present, and future oil and gas exploration and development in the Beaufort and Chukchi seas, please refer to following recent documents:

(1) 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").
(2) Environmental Assessment — Shell Offshore Inc. [Shell], Beaufort Sea Exploration Plan, 2007-2009 (MMS, 2007b).
(3) 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).
(4) 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).
(5) Draft Environmental Impact Statement - Outer Continental Shelf Oil and Gas Leasing Program: 2012- 2017 (Bureau of Ocean Energy Management [BOEM], 2011).
(6) Draft Environmental Impact Statement – Effects of Oil and Gas Activities in the Arctic Oceans (NMFS, 2011).
(7) Point Thomson Project Draft Environmental Impact Statement. (U.S. Army Corps of Engineers [USACE], 2011).

Beaufort Sea

Oil and gas exploration and production activities have occurred on the North Slope for more than 50 years. Onshore areas have experienced more oil and gas-related development compared to nearshore and offshore waters of the Beaufort Sea. Associated industrial development has included the creation of an industrial enclave complex at Deadhorse and an interconnected industrial infrastructure network that includes airports/airstrips, roadways, pipelines, production and processing facilities, gravel mines, and marine docks and causeways.

Exploration for oil and gas in nearshore and offshore areas of the Beaufort Sea has occurred intermittently during the past 30 years. Several discoveries have resulted in field development from wells drilled directionally from onshore facilities, and from a limited number of structures in nearshore waters (defined as inside the barrier islands) and offshore waters (defined as outside the barrier islands). BP Exploration Alaska, Inc. is currently producing oil from an offshore development in the Northstar Unit, which is located between 3.2 and 12.9 kilometers (km) (2 and 8 mi.) offshore from Point Storkersen in the Beaufort Sea, and 5 km (3 mi.) seaward of the closest barrier island. This development makes use of a subsea pipeline to transport oil to shore and then into the TAPS. The unit is adjacent to Prudhoe Bay, and is approximately 87 km (54 mi.) northeast of Nuiqsut, an Iñupiat community. To date, it is the only offshore oil production facility north of the barrier islands in the Beaufort Sea.

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, Oooguruk, 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).

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 the Sale 186 area (15,217 hectares), 83 leases from Sale 195 (170,464 hectares), and 89 leases from Sale 202 (196,276 hectares) in the Beaufort Sea. 31 exploratory wells have been drilled and there is production from a joint federal/state unit at Northstar, with federal production of over 25 million barrels of oil since 2001.

Active State of Alaska leases in the Beaufort Sea are located within 5.5 km (3 nautical miles [n. mi.]) of the coast, except in the areas of Harrison Bay and Smith Bay, which are considered historical bays thus extending the area beyond 5.5 km (3 n. mi.) from the coastline. Most of the State's active leases are concentrated between Harrison Bay and Point Thomson. As of May 2011, the State has 360,435 acres on 189 leases in the Beaufort Sea. Exploratory activities (drilling and seismic surveys) could occur in any of these active state leases within the five year period beginning in 2012.

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. More seismic activity permitted by MMS (now BOEM) has occurred in the Beaufort Sea OCS than in the Chukchi Sea OCS (MMS, 2006b).

In general, site clearance and shallow hazards surveys are of lesser concern regarding impacts to cetaceans than the deep two-dimensional (2-D)/three-dimensional (3-D) surveys (NMFS, 2010). High-resolution site clearance and shallow hazards surveys usually do not occur in close proximity to each other, thereby decreasing the potential for adverse effects on marine mammals resulting from aggregation of impacts. In addition, the potential for cumulative adverse impacts to marine mammals from all seismic surveys and site clearance activities is limited by required mitigation and monitoring measures.

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).

Site Clearance Survey Activities. To date, high-resolution site-clearance surveys in the Beaufort Sea OCS were conducted for 30 exploration wells. Additional site-clearance surveys may have been conducted in the proposed action area where no exploration wells were drilled.

Oil and Gas Exploration and Development. Since the discovery and development of the Prudhoe Bay and Kuparuk oil field, more recent fields generally have been developed not in the nearshore environment, but on land in areas adjacent to existing producing areas. Notable exceptions to this are the Northstar, Endicott, and Lisburne fields. Endicott Field was developed using causeways whereas the Lisburne Field was developed using directional drilling from shore. The Oooguruk 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 Oooguruk 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.

Chukchi Sea

Lease Sales. Three federal lease sales for the OCS have been held in the Chukchi Sea planning area between 1979 and 2008. Five exploration wells were drilled in the Chukchi Sea between 1989 and 1991, but no commercial production has occurred in the Chukchi Sea planning area.

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 (BOEMRE, 2011a). As a result of a lawsuit challenging the sale, the U.S. District Court for the District of Alaska remanded Sale 193 pending further analysis pursuant to NEPA. After issuance of the Supplemental Environmental Impact Statement (SEIS) (BOEMRE, 2011a) in August 2011, the Department of the Interior filed a Record of Decision (ROD) affirming the sale of the 487 leases under Lease Sale 193. All of these leases are subject to a series of 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, a site-specific monitoring program to assess behavioral effects on a number of marine mammals and polar bears, and conflict avoidance mechanisms to protect subsistence harvesting activities.

Seismic Survey and Site Clearance Activities. 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. 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. Seismic survey activity increased between 1980 and 1991, when MMS issued 30 G&G permits. In the 1980s, five high-resolution site-clearance surveys were conducted in the Chukchi Sea OCS prior to five exploration wells being drilled.

More recent seismic exploration activities were conducted by industry in the Alaskan Chukchi Sea in 2006–2010. The total number of miles of vessel trackline 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 in 2007, 2008, and 2010, but only a single shallow hazard program was conducted in 2009 (Shell, 2011).

Oil and Gas Exploration and Development. Five exploration wells were drilled in OCS waters of the Chukchi Sea in the 1980s. Studies of similar wells in the Beaufort Sea suggest that there are few measureable effects at past exploration well sites (Trefry and Trocine, 2009; Shell, 2011). There are currently no operating oil or gas facilities in the Chukchi Sea Planning Area.

4.6.1.2 Reasonably Foreseeable Future Oil and Gas Activities

Beaufort Sea

Lease Sales. The current MMS five year leasing program for 2007 through 2012 initially called for two additional leases in the Beaufort Sea planning area; Sale 209 in 2009 and Sale 217 in 2011. However, these leases were removed from the *Revised Program Outer Continental Shelf Oil and Gas Leasing Program 2007-2012,* issued by BOEMRE (now BOEM) in December 2010. Additional federal leases in the Beaufort Sea leasing area may be considered in the 2012-2017 leasing program. Options for the Federal OCS Lease Sales during the five year period from 2012-2017 include one lease sale in the Beaufort Sea Planning Area to occur in 2015. The lease sale area would establish a bowhead whale migration deferral zone comprised of the following areas: the Barrow Subsistence Whaling Area that defers 49 whole or partial blocks located at the western border of the planning area; and the Kaktovik Subsistence Whaling Area that defers 28 whole or partial blocks located offshore of Kaktovik (BOEM, 2011).

The State of Alaska plans to conduct area-wide lease sales in the Beaufort Sea annually through 2015, potentially adding new areas where exploratory activities could occur. Industry activities on State of Alaska Beaufort Sea leases in the recent past have largely been concentrated between Harrison Bay and Point Thomson. With one exception, it is assumed that future activities would be concentrated between Harrison Bay and Point Thomson, but could eventually expand beyond that area. In addition to oil and gas production activities presently occurring in Beaufort Sea nearshore areas, Shell proposes to drill four exploration wells, two on the Sivulliq prospect and two on the Torpedo prospect, both near Camden Bay in the Beaufort Sea OCS Planning Area.

Seismic Survey and Site Clearance Activities. Given the growing interest of oil and gas companies to explore and develop oil and gas resources on the Arctic Ocean OCS, future seismic surveys and site clearance activities in the Beaufort Sea are considered to be reasonably foreseeable. Future seismic 2-D/3-D surveys in the Beaufort Sea planning area are expected to occur at a maximum rate of six surveys per year between 2012 and 2017. One survey per year could potentially involve icebreaking activity. In addition, a maximum of one on-ice seismic survey per year could be expected to occur in the Beaufort Sea area during the time period between 2012 and 2017. In those leased blocks where there is sufficient potential for exploration drilling or development and production, shallow hazard and site clearance surveys would be required. Shallow hazard and site clearance surveys could be expected to occur at a maximum rate of five per year in the Beaufort Sea area between 2012 and 2017.

Because of the limited time period of open water, it is likely that concurrent surveys would be conducted in the same general time frame, but would not overlap in space (i.e., with a minimum distance of approximately 24 km [15 mi.] between each independent survey operation) for reasons regarding data integrity. It is assumed for analytical purposes that at least one of the authorized 2-D/3-D seismic surveys in the Beaufort Sea would utilize an ice breaker.

Exploratory activities in the Beaufort Sea (including deep penetration seismic, site clearance, and high-resolution shallow hazards surveys) in the next five years will be concentrated in areas of recently purchased leases. This does not mean that there will not be exploratory activities in other areas of the U.S. Beaufort Sea; however, areas adjacent to Camden Bay and Harrison Bay are currently the primary areas of interest for exploration. For analytical purposes, reasonably foreseeable oil and gas seismic surveys and site clearance activities in the Beaufort Sea are expected to be concentrated in those areas (see Figure 4.6.1.1-1).

Oil and Gas Exploration and Development. Activities on new and existing leases in the Beaufort Sea are expected to continue in the foreseeable future. Such activities may include the construction and installation of a product pipelines to shore from existing offshore production facilities in the Beaufort Sea, and expansion of existing offshore and shore-based facilities to accommodate natural gas production.

In addition to oil and gas production activities presently occurring in Beaufort Sea nearshore areas, and from the Northstar and Endicott fields, Shell proposes to drill four exploration wells, two on the Sivulliq prospect and two on the Torpedo prospect, both near Camden Bay in the Beaufort Sea OCS Planning Area. Two wells each would be drilled into two distinct oil and gas prospects named by Shell as “Sivulliq” and “Torpedo.” Shell proposes to drill the four wells during the open-water season (July through October) starting in 2012 and continuing until the four-well program is completed. Shell’s proposed activities include a mid-drilling-season suspension of activities beginning August 25 to avoid conflicts with the fall subsistence bowhead whale hunts of the villages of Kaktovik and Nuiqsut and a reduction in the exploration drilling waste stream discharged into the Beaufort Sea and transportation of some waste to an approved treatment/disposal facility outside of the Arctic (Shell 2011 - 2012 Camden Bay EP). Additional mitigation measures associated with the proposed activity may include the establishment of communication centers and voluntary participation in Conflict Avoidance Agreements (CAAs), intended to improve communication and understanding between subsistence users and oil and gas operators.

The Liberty Project is located on the eastern end of the Prudhoe Bay area, in nearshore waters of Prudhoe Bay. It was initially conceived as an offshore production island, but has been redesigned as a directional drilling project from a location at the Endicott Satellite drilling island. Exploratory drilling was suspended in 2010. Development within the next five years is possible. Road access would be provided through the existing Prudhoe Bay road system; barge support for construction would be based out of Prudhoe Bay, with modules and other construction material transported by gravel roads. Air traffic would use the existing Prudhoe Bay air facilities. The project would involve barge sealifts through the Chukchi and Beaufort seas, and offloading activity at West Dock.

The Alpine Development Area, located about 54.7 km (34 mi.) west of Kuparuk River Field and 12.8 km (8 mi.) north of the village of Nuiqsut, is estimated to contain more than 400 million barrels of recoverable oil. Barge support for construction would be based out of Prudhoe Bay, with modules and other construction material transported by gravel/ice roads. Air traffic would be associated with construction and operations. The Alpine project would also involve barge sealifts through the Chukchi and Beaufort seas, and offloading activity at West Dock.

The Badami project is located approximately 32 km (20 mi.) east of Prudhoe Bay on the Beaufort Sea coast. It is connected by pipeline to Endicott, but there are no all-season road connections; Badami has a gravel causeway barge dock. The facility went into production around 2001, but was suspended in 2007 after production results were less than expected. Additional winter exploratory drilling is currently being conducted; depending on results, production could be resumed in the foreseeable future. Some improvements to the dock and other facilities may be needed. Restart of production at Badami would involve barge sealifts through the Chukchi and Beaufort seas, and offloading activity at the Badami facility on the Beaufort Sea coast.

Activities on new and existing leases in the Canadian Beaufort Sea are expected to continue in the foreseeable future. In particular, the Amauligak offshore oil field in the Canadian Beaufort Sea could be developed within the foreseeable future. On the Mackenzie Delta, the Ikhil gas discovery is being developed to supply natural gas to the town of Inuvik, where it will replace imported diesel oil for power generation and domestic use (BOEM, 2011).

Chukchi Sea

Lease Sales. The current MMS five year leasing program for 2007 through 2012 initially called for two additional lease in the Chukchi Sea planning area; Sale 212 in 2009 and Sale 221 in 2010. However, these leases were removed from the *Revised Program Outer Continental Shelf Oil and Gas Leasing Program 2007-2012,* issued by BOEMRE in December 2010. Additional federal leases in the Chukchi Sea leasing area may be considered in the 2012 - 2017 leasing program. Options for the Federal OCS Lease Sales during the five year period from 2012 - 2017 include one lease sale in the Chukchi Sea Planning Area, to occur in 2016. The lease sale area would establish a 40 km (25 mi.) buffer deferral corridor along the Chukchi Sea coast (BOEM 2011). The 40 km (25 mi.) buffer provides additional protection from potential impacts to bowhead whales during their spring migration because there would be no OCS infrastructure or activity in the migration area, which is limited to within 40 km (25 mi.) of the coast.

In the western Chukchi in Russian waters, there has been little exploration activity. The simultaneous U.S./Russia OCS lease sale that was proposed in the five year program for 1992 through 1997 was canceled, with this area being deferred for consideration in later programs (MMS, 2006b). No additional oil and gas development activities have been identified in the Russian Chukchi Sea.

Seismic Survey and Site Clearance Activities. Given the results of recent lease sales and growing interest of oil and gas companies to explore and develop oil and gas resources on the Arctic Ocean OCS, future seismic surveys and site clearance activities in the Chukchi Sea are considered to be reasonably foreseeable. Future seismic 2-D/3-D surveys in the Chukchi Sea planning area are expected to occur at a maximum rate of five surveys per year between 2012 and 2017 (NMFS, 2011). One survey per year could potentially involve icebreaking activity in the Chukchi Sea. Shallow hazard and site clearance surveys would be required in those leased blocks where there is sufficient potential for exploration drilling or development and production. Shallow hazard and site clearance surveys could be expected to occur at a maximum rate of five per year in the Beaufort Sea area between 2012 and 2017 (NMFS, 2011).

Because of the limited time period of open water, it is likely that concurrent surveys would be conducted in the same general time frame, but will not overlap in space (i.e., within a minimum of approximately 24 km [15 mi.] of each independent survey operation) for reasons regarding data integrity. It is assumed for analytical purposes that at least one of the authorized 2D/3D seismic surveys in the Chukchi Sea would utilize an ice breaker.

Seismic survey and site clearance activities in the Chukchi Sea (including deep penetration seismic, site clearance, and high-resolution shallow hazards surveys) in the next five years will be concentrated in areas of recently purchased leases. For analytical purposes, reasonably foreseeable seismic survey and site clearance activities in the Chukchi Sea are expected to be concentrated in the areas leased under Lease Sale 193.

Oil and Gas Exploration and Development. Shell has identified six proposed drill sites within its Chukchi Sea lease blocks, and plans to drill six exploration wells beginning in 2012. During each drilling season, Shell will mobilize a drillship and support vessels through the Bering Strait on or after 1 July, reaching the first Chukchi Sea drill site on or about July 4 as ice conditions permit. Exploration drilling activities will cease on or before October 31. Shell will demobilize the drillship and support vessels out of the Chukchi Sea at the end of each drilling season.

ConocoPhillips Company (COP) plans to conduct exploration drilling on leases purchased during the Chukchi Sea Lease Sale 193. Drilling activities would be conducted at one or two sites located in lease blocks 6123, 6074, 6023, 6220, and 6073 in the vicinity of the historic Klondike well drilled by Shell in 1989. COP has labeled this new project “Devil’s Paw Prospect.” COP plans to commence drilling activities in the summer of 2013 with a contingency plan to commence drilling in 2014 or 2015 if conditions to drill are not met in 2013. The prospect is located in Chukchi Sea waters that are approximately 140 feet (ft) deep, approximately 193 km (120 mi.) west of the village of Wainwright, and 145 km (90 mi.) north from Point Lay. It is anticipated that the drilling program would span 120 days during the first year of exploration drilling. Timing and actual order of operations would depend on regulatory approvals, ice conditions and forecasts, and length of time available for drilling during open water.

Statoil owns the rights to several lease blocks purchased during the Chukchi Sea Lease Sale 193. The company has the final results from the 3-D seismic survey carried out in its Chukchi Sea leases in fall 2010, and is assessing these results, anticipating a drilling decision by the middle of 2012.

Large-Scale Future Oil and Gas Projects in Alaska

Alaska Pipeline Project. In 2008, TransCanada Alaska Company, LLC and Foothills Pipe Lines, Ltd., secured the Alaska Gasline Inducement Act (AGIA) license to develop a large-diameter natural gas pipeline project to treat, transport, and deliver gas from the North Slope of Alaska to markets in North America. In June 2009, TransCanada announced that ExxonMobil would join as partner in the effort. The Alaska Pipeline Project (APP) will include the installation and operation of a gas treatment plant (GTP) at Prudhoe Bay on the Alaskan North Slope near the Beaufort Sea coast. The GTP site will be located on state land within the North Slope Borough and entirely within the Prudhoe Bay Unit. Assuming that the open season commercial negotiations are successful and the permitting process results in granting the necessary authorizations, construction is planned for 2014 through 2020.

Three sealifts are scheduled to occur for GTP construction; in 2017, 2018, and 2019. Sealifts of this proportion typically entail a number of vessels that would be traveling from Dutch Harbor through the Bering Strait, then along the Alaska Chukchi Sea coast and around Point Barrow to Prudhoe Bay. Initial channel dredging for GTP site preparation is anticipated to require approximately 45 days of near-shore open water at Prudhoe Bay, and is planned for the summer of 2016 prior to Sealift Number 1. Prior to all sealifts (or at first open-water at Prudhoe Bay) in 2017, 2018, and 2019, maintenance screeding (leveling)/dredging will be performed as required to return the channel to specification width and depth.

Point Thomson Project. Exxon Mobil is proposing to produce gas and hydrocarbon liquids (condensate and oil) from the Thomson Sand reservoir and to delineate other hydrocarbon resources in the Point Thomson area on the North Slope of Alaska. Produced fluids will be processed on site, with condensate and oil being transported by pipeline to existing common-carrier pipelines that supply the TAPS.

Sealift by ocean-going barges direct to the Point Thomson location was selected as the option for moving heavy loads, such as process modules, to the site. Module transportation to the project site is scheduled for summer 2013. It is anticipated that the large ocean barges will be in place at the Point Thomson site for approximately 14 days, providing adequate time to dock and offload cargo. Once offloaded, the barges will leave the site.

Construction and operation will supported by coastal barge access during the open water season. A bulkhead and five offshore mooring dolphins (pilings driven into the sea floor) are necessary for landing and securing the ocean barges, which require several feet of draft and cannot directly access the beach. The bulkhead (referred to as the high bulkhead) will be located above the Mean High Water (MHW) line on the beach. To better accommodate landing and offloading of the smaller coastal barges, a piling-supported service dock will also be constructed, with an associated gravel ramp constructed to the Central Pad.

Summary. 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.

4.6.1.3 Effects of Noise on Bowhead Whales

Past and Present Effects

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 manmade 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 EIS, the effects of oil and gas activities on bowhead whales are discussed at length in several documents: NMFS (2011), BOEM (2011), NMFS (2006), and MMS (2006a) with additional information presented on the BOEM Alaska OCS Region website: http://www.boem.gov/Environmental-Stewardship/Alaska-OCS-Region.aspx. 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. Eskimo 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). In response, oil companies have established communications centers to preclude unwanted interactions between subsistence hunters and development activities. In a March 1997 workshop on seismic-survey effects conducted by MMS (now BOEM) in Barrow, Alaska, with subsistence whalers from the communities of Barrow, Nuiqsut, and Kaktovik, whalers 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)

Studies in the 1980s indicated that bowheads appeared to recover from these behavioral changes within 30 - 60 minutes following the end of seismic activity (Richardson et al., 1986b; Ljungblad et al., 1988). Monitoring studies of 3-D seismic exploration in the nearshore Beaufort Sea during 1996-1998 have demonstrated that nearly all bowhead whales will avoid an area within 20 km of an active seismic source (Richardson et al. 1999). Sound levels received by bowhead whales at 20 km ranged from 117 - 135 dB re 1 µPa (rms)[11] and 107-126 dB re 1 µPa (rms) at 30 km, but did not persist beyond 12 hours after seismic operations (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).

Richardson et al. (1986) 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.); other whales in the area continued feeding until the seismic vessel was within 3 km (1.9 mi.). 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 could, with long term exposure, 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 from drill ships, although bowheads change their migration speed and swimming direction to avoid close approach to noise-producing activities. During autumn migration, however, 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

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[11] Sound pressure level (SPL) is typically measured in decibels (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 root mean square (root mean square is a statistical measure of the amplitude of the variable intensity of a sound wave).

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 voiced 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 overall health, current status, or recovery of the bowhead population (MMS, 2006b). Potential impacts of individual activities associated with oil and gas exploration on bowhead whales would be mostly of medium intensity, temporary duration, and localized, evaluated collectively, and with consideration given to reduced adverse impacts through the implementation of the standard mitigation measures, as appropriate, the overall impact to bowhead whales is likely to be 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).

Reasonably Foreseeable Future Effects

Oil and gas activities during migration could potentially add to the overall noise and disturbance from subsistence hunting activities and potentially affect distribution and habitat use (MMS, 2006c). In addition, impacts to subsistence hunting practices may result from the presence of noise and lights that may disturb/deflect whales and other subsistence resources, and concerns over access and detracting from the subsistence experience. Countervailing effects may result from the presence of facilities that provide safety and fuel for subsistence users in case of emergencies, and industry docks that may be used to offload and transport harvested whales during the fall hunt.

Whales disturbed by noise and activity from all sources in nearshore waters, including site-clearance seismic surveys, 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 may 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 as a result of 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, but 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 considered minor at the population or stock level. A detailed discussion of the contribution of effects of oil and gas activity to the overall cumulative effects on bowhead whales is presented in the 2006 Arctic Region Biological Opinion for Oil and Gas Activity in the Beaufort and Chukchi Sea (NMFS, 2006) and the 2007 Chukchi Oil and Gas Lease Sale 193 Final EIS (MMS, 2007a; NMFS, 2011).

4.6.1.4 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 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.

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 EIS 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 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.

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; and 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 are also possible if a VLOS event coincided with and affected a large feeding aggregation of bowhead whales during the open water season, particularly if calves were present.

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, such as whether oil was directly ingested, the quantity ingested, and whether ingestion was indirect through prey consumption. 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 impact of a VLOS on bowhead whales could be state-wide, given the migratory nature of bowhead whales.

Human activities associated with oil spill response and cleanup could include vessel and aircraft traffic, booming and skimming operations, in-situ burning, dispersant application, drilling of a relief well, research, and monitoring. These activities would be expected to result in temporary and 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, 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 would be expected to 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 as much as 20 - 30 km around relief well drilling operations. Specific cetacean protection actions would be employed 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 and fouling 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 also 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 most probably be small. The North Slope Borough (NSB) believes there are some scenarios, such as an oil spill in a spring lead system near Barrow, which could affect a large portion of the population (J. C. George, NSB, personal communication, December 20, 2007). Although the likelihood of such an event is extremely low, the perception of tainted resources among subsistence harvesters could be a long lasting effect of any oil spill in the EIS project area.

4.6.2 Climate Change - Cumulative Effects of Environmental Variability

4.6.2.1 Past and Present Effects of Climate Change

Climate change is an important factor in the consideration of cumulative environmental effects in Arctic regions (NOAA, 2011). It is well established that the rates of change for climate conditions in Arctic regions have been accelerating, particularly during the last 20 years (Arctic Council, 2005; Intergovernmental Panel on Climate Change [IPCC], 2007; USGS, 2011). Environmental changes include warmer air and ocean temperatures, decreased extent and thickness of sea ice, and changes in the timing and duration of phytoplankton blooms in the Beaufort Sea (USGS, 2011; BOEMRE, 2011a; BOEMRE, 2011b). These changes have been attributed to rising CO_2 levels in the atmosphere and corresponding increases in concentrations of CO_2 dissolved in seawater.

Dissolution of CO_2 in seawater results in the formation of carbonic acid, which increases the hydrogen ion concentration and “acidifies” the seawater (IPCC, 2007). Ocean acidification in Arctic regions is happening at a faster rate compared to other areas because the capacity of the Arctic Ocean to absorb CO_2 is increasing in response to changes in sea ice cover resulting from climate change (Fabry et al., 2009). Loss of sea ice in the Arctic has increased the area and duration of exposure of seawater to the atmosphere, allowing for enhanced gas exchange across the air-sea interface, and increasing the sink for atmospheric CO_2 from 24 TgC yr^{-1} to 66 TgC

yr^{-1} over the past three decades (Bates et al., 2009). Furthermore, melting of sea ice reduces the saturation of seawater with regard to calcium carbonate, which further increases the capacity for dissolution of CO_2 in seawater (Steinacher et al., 2009).

In the past few decades, evidence of climate change has increasingly been reported in a variety of geophysical, biological, oceanographic, and atmospheric sources. The scientific evidence indicates that average air, land, and sea temperatures are increasing at an accelerating rate. Although climate changes have been documented over large areas of the world, the changes are not uniform and effect different areas in different ways and intensities. Arctic regions have experienced some of the largest changes, with major implications for the marine environment as well as for coastal communities. Recent assessments of climate change, conducted by international teams of scientists (Gitay et al. [2002] for the IPCC, Arctic Climate Impact Assessment [ACIA] 2004; IPCC, 2007), have reached several conclusions of consequence for this EIS:

- Average Arctic temperatures increased at almost twice the global average rate in the past 100 years.
- Satellite data since 1978 show that perennial Arctic sea ice extent has shrunk by 2.7% per decade, with larger decreases in sea ice extent in summer of 7.4% per decade.
- Arctic sea ice thickness declined by about 40% during the late summer and early autumn in the last three decades of the twentieth century.
- The ice pack is retreating from the land sooner in the spring and reforming later in the fall. This affects the timing of phytoplankton blooms and zooplankton concentrations.
- The ice pack is retreating farther seaward than in the past, which creates larger areas of open water near coastal areas and leads to larger waves, higher storm surges, and accelerated rates of coastal erosion.
- The arctic tundra is warming rapidly, causing permafrost to thaw deeper in the summer and over much larger areas than previously observed, accompanied by substantial changes in vegetation and hydrology.
- The melting ice pack, melting glaciers, and increased precipitation are adding large amounts of freshwater to the sea, causing decreases in salinity that may combine with longer ice-free seasons to affect the timing and intensity of phytoplankton blooms.

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; the September sea-ice extent decreased almost 25 percent between 1976 and 2006, leaving the Beaufort and Chukchi seas essentially ice-free during September to above 75°N in recent years (USGS, 2011). 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. In any case, it is likely that the effects of climate change on bowhead distributions are mediated by shifts in the abundance and distribution of planktonic prey organisms in addition to changes in the distribution of ice habitat (Tynan and DeMaster, 1997).

4.6.2.2 Reasonably Foreseeable Future Climate Change Effects

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; USGS, 2011). 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 are melted. This creates a positive feedback loop with regard to warming in snow and ice-covered regions. 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). The projected climate changes, if realized, would 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 (USGS, 2011). However, projections of future sea ice trends in the Arctic are challenging. The enormous range of sea-ice projections among all AOGCMs suggests a high degree of uncertainty with regard to future sea ice conditions (USGS, 2011). Most AOGCMs predict that sea ice will still be present in the Beaufort and Chukchi seas for most of the year; however, most also suggest that the ice pack will be thinner and more dynamic than it historically has been.

In addition, pronounced changes in sea level pressure (SLP) projected to occur in the Bering, Beaufort, and Chukchi seas during autumn and winter are expected to impact storm tracks and surface winds, although the nature of those impacts is not exactly clear (USGS, 2011). Predicted decreases in SLP in the Bering, Beaufort, and Chukchi seas during winter and autumn may suggest an increase in storm activity in this region during autumn and winter. However, the bulk of the SLP decrease also could be due to warmer air temperatures associated with decreases in sea ice or other factors. Nevertheless, several arguments can be made suggesting that it will be stormier during autumn and winter (Chapman and Walsh, 2007; Serreze and Barry, 2005; USGS, 2011). Changes in the frequency and distribution of storm events in the Beaufort and Chukchi seas could influence the efficacy of subsistence harvest practices in the EIS project area.

The implications of climate trends for subsistence harvest of bowheads are uncertain but they may be beneficial in terms of population levels, in contrast to effects on populations of ice-obligate species such as polar bears and walrus (ACIA, 2004). There will be more open water and longer ice-free seasons in the arctic seas which may allow bowheads to expand their range as the population continues to recover from commercial whaling. However, this potential for beneficial effects will depend on the ability of bowheads to locate sufficient concentrations of planktonic crustaceans to allow efficient foraging. 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). 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 (ACIA, 2004).

In addition, if changes in formation 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 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. As a consequence, 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 the Chukchi Sea communities. 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 and meet allotted quotas (Comstock, 2011). For the past 10 years bowheads have been feeding more frequently in ice-free waters northeast of Barrow than in the past, leading to increased hunting success for 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 opportunities for bowheads agrees with modeling predictions that the retreat of the ice edge relative to the underwater shelf break facilitates wind-driven upwelling of zooplankton-rich waters, as well as allowing greater primary production in ice-free waters, which leads to a beneficial increase in prey availability for bowheads (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; 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). Bowheads have also been observed feeding during the summer in the northeastern Chukchi Sea (Clarke and Ferguson, 2010b). Another indication of how bowhead whales are responding to decreased sea ice is that the population has increased steadily during roughly two decades of sea-ice loss in the western Beaufort Sea (George et al., 2004). This suggests that sea-ice loss is not hindering productivity of this population as it slowly recovers from commercial over-exploitation. Although the long-term effects of climate change on the subsistence harvest of bowhead whales are unclear, bowhead populations will likely fare well compared to those of ice-obligate species (Moore and Huntington, 2008).

4.6.3 Vessel and Aircraft Traffic

4.6.3.1 Past and Present Effects

Vessel traffic within the proposed action area can currently be characterized as traffic to support oil and gas industries, barges or cargo vessels used to supply coastal villages, smaller vessels used for hunting and local transportation during the open water period, military vessel traffic, vessels conducting scientific research, and recreational vessels such as cruise ships and a limited number of ocean-going sailboats. Commercial fishing occurs in the southern range of bowhead whales. Commercial shipping and fishing activities would potentially affect mortality of bowhead whales through ship strikes or interactions with fishing gear, or result in disturbance from vessel noise. Between 1976 and 1992, only three ship strike injuries were documented out of a total of 236 bowhead whales examined from the Alaskan subsistence harvest (George et al., 1994). Since that publication, six additional whales have been noted with ship-strike injuries (1995 - 2002) out of approximately 180 examined whales (J.C. George, Department of Wildlife Management, NSB, personal communication), indicating that the rate of ship strikes may have increased slightly in recent years. The most recent stock assessment provides no estimate for past mortality from ship strikes (Allen and Angliss, 2011). The low number of observed ship strike injuries suggests that bowheads either do not often encounter vessels or that they avoid interactions with vessels. It is possible that an unknown number of unobserved and unreported mortalities may occur after ship strikes. However, given the steadily increasing population trend, the magnitude of this potential effect is likely to be small. It is not known when or where ship strikes are most likely to occur.

Most commercial fishing activity in the Bering Sea occurs well south of the range of bowhead whales. There are very limited commercial fisheries in the Chukchi Sea and none in the Beaufort Sea due to small commercial fish stocks, operating difficulties near sea ice, management guidelines, and great distance to markets (ACIA, 2004). 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, since 1978 there have been approximately 20 reports of scarring by fishing lines and entanglement in crab fishing gear from bowheads that have been harvested or found stranded on beaches (Angliss and Outlaw, 2005). Data from the NSB Department of Wildlife (1990-2001) suggest that perhaps 10% of the population exhibits clearly identifiable fishing line injuries of varying degrees of severity (George, 2001). It is not known whether these injuries are from active fishing gear or from gear that had been lost and drifting. The number of serious injuries resulting from fishing gear entanglement appears to be very small. The most recent stock assessment report attributes 0.2 mortalities per year resulting from interactions with fishing gear (Allen and Angliss, 2011). Stranding reports document entanglements between 2001 and 2005, including a bowhead whale observed near Point Barrow with fishing net and line around the head (Allen and Angliss, 2011) (also see Table 3.2.7-1 in Chapter 3 of this EIS). A dead bowhead whale found floating in Kotzebue Sound in July 2010 was entangled in crab pot gear similar to that used in the Bering Sea crab fishery. The entanglement through the mouth and around the tail stock may have been the cause of death (Suydam et al., 2011).

Helicopters and fixed wing aircraft are used to support routine activities within the EIS project area, and fly in near shore and offshore areas. The majority of air travel and freight hauling between Arctic coastal communities involves small commuter-type aircraft, and government agencies and researchers often charter 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 proposed action 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 limited sound transmissibility from air to water, except at steep incidence angles, aircraft underwater noise levels are low relative to vessel noise outside limited areas beneath the aircraft. The level of aircraft noise reaching the sea surface and transmitting into the water depends on the aircraft flight altitude and flight speed, with higher received levels at low flight altitudes and increased flight speed. The combination of audible and visual (aircraft and shadow) stimuli may produce higher levels of response than the noise alone (Richardson et al., 1995a). Like acoustic effects, visual stimuli effects decrease with increased flight altitude. Because aircraft travel at high speeds, the duration of aircraft noise events is typically just a few tens of seconds (Patenaude et al., 2002). However, aircraft involved in certain duties may 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.

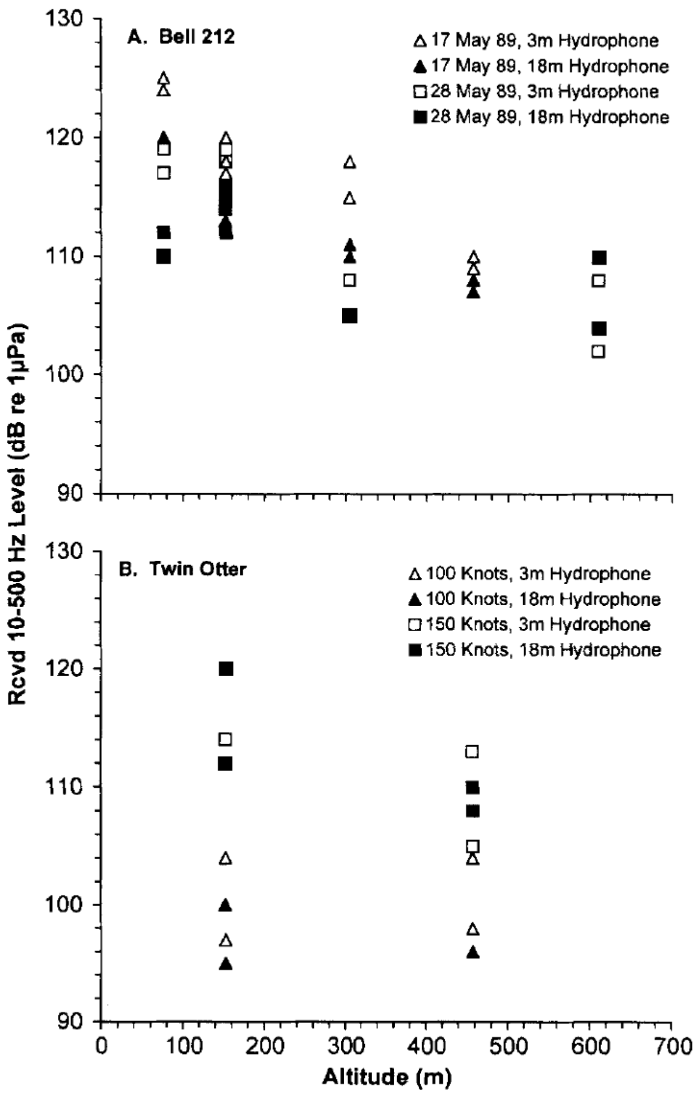

Figure 4.6.3-1. Received levels of underwater sound from (A) Bell 212 helicopter and (B) Twin Otter fixed-wing aircraft flying directly overhead vs. aircraft altitude, hydrophone depth, and (for Twin Otter) airspeed. Open and filled symbols show paired measurements at 3 m and 18 m hydrophone depths, 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, and came from generally from brief sightings (less than 3 minutes). 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 15% of bowheads overall 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, at approximately 31% 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, the effects of anthropogenic noise, such as vessel or aircraft noise, on bowhead whales are primarily related to temporary disturbances in limited geographic areas and are expected to make minor contributions to cumulative impacts on bowhead whales. The effects of noise are discussed in greater detail in Section 4.6.1.3.

4.6.3.2 Reasonably Foreseeable Future Effects

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 vessel traffic in the proposed action area, regardless of oil and gas activity. 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 study area. Increased ship traffic may also be associated with offshore seismic exploration and exploratory drilling for oil and gas. Increased vessel traffic in the Beaufort and Chukchi seas would be likely to result in greater disturbance effects on foraging bowheads and could result in a higher incidence of ship strikes with the potential for serious injury and mortality. However, if bowheads are able to move away from future shipping lanes and still find suitable foraging areas, the increased risk of ship strikes could be minimal.

Commercial and subsistence fishing activities are certain to continue in the future but potential changes in fishing effort relative to the range of the bowhead are not clear. Some commercially exploited fish stocks may expand in both abundance and northward range as a result of climate warming while other stocks are predicted to decline (ACIA, 2004). It is not clear whether such changes would lead to increased or decreased fishing effort in arctic waters. The potential risk of injury to bowheads from entanglement in fishing gear is therefore uncertain but likely to remain small in the foreseeable future because of the relatively high cost of transporting arctic fish resources to distant markets. For the time being, an Arctic FMP prepared by the North Pacific Fisheries Management Council has deferred authorization of commercial fishing in Arctic waters.

The effects of anthropogenic noise, such as vessel and aircraft noise, on bowhead whales are primarily related to disturbance of migration. The effects of noise are discussed in detail in Section 4.6.1.3.

4.6.4 Research Activities

4.6.4.1 Past and Present Effects

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. The programs conducted by these 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. Previous environmental assessments, such as the environmental assessment for Shell's Beaufort Sea marine research program, describe such programs in detail and are incorporated here by reference (BOEMRE, 2010).

Underwater noise generated by icebreakers may be a substantial source of impact within the EIS project area. The Western Arctic Shelf Basin Interactions project was a multi-year, interdisciplinary program investigating the impacts of climate change on biological, physical, and geological processes in the Western Arctic Ocean. The project was conducted from the U.S. Coast Guard HEALY and POLAR STAR icebreakers. 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. Current research focuses on population growth, genetics, and response to anthropogenic sources, particularly because bowheads use habitat near oil and gas developments. The following briefly describes the type of research being conducted on bowhead whales.

Radio and satellite tracking provides information on the migration pattern and timing, distribution, and habitat use (Mate et al., 2000). Tags are placed on whales through the use of a pole extended from a vessel in close proximity to the whale, or via a crossbow. Skin biopsy samples are also taken to study genetic variability among and within stocks, as well as sex of the whales. The characteristics and segregation of size and age class, in addition to calf growth patterns, are determined through the use of photo identification and photogrammetry taken during aerial surveys (Rugh, 1990; Koski et al., 1993).

In addition, the Bowhead Whale Aerial Survey Project (BWASP) surveys the autumn migration of bowhead whales through the Alaskan Beaufort Sea; transect data are also collected for other marine mammals species as part of the BWASP program. Land, vessel, and aerial surveys are conducted to collect data on population abundance, distribution, and behavior throughout the bowhead whales' range. Individual and group behaviors are observed during these surveys to provide information on feeding ecology, distribution, habitat use, and behavior. Shore-based counts along the migration route, particularly at Point Barrow, are supplemented with acoustic survey data (George et al., 2004a). Acoustic survey data are collected with the use of autonomous acoustic recorders. Calls of individual whales are localized in real time or once the recorders have been collected. Many studies have also been conducted to determine the effect of anthropogenic noise (i.e., drilling, dredging, seismic surveys) on the behavior of bowhead whales (e.g., Richardson et al., 1995a,b). Ship-based surveys may result in avoidance of the vessel and temporary disturbance of individual whales. Aerial surveys are generally flown at heights that do not disturb whales.

Various tissue samples are taken from harvested or stranded whales for physiological studies. Stomach content analysis and isotopic composition of materials (baleen, muscle, and blubber) provide information on the feeding ecology (e.g., Lowry, 1993). These studies can be supplemented with collection of zooplankton in feeding areas to determine the prey composition. Reproductive tissues are taken to determine age of whales, pregnancy rates, and toxicology studies (effects of contaminants on tissues) (e.g., Willetto et al., 2002). Mortality of bowheads is studied by looking at the bacterial, mycotic, and viral infection rates of harvested whales (Philo et al., 1993). Because tissue samples are taken from whales already dead, there would be no effects on bowheads associated with this type of research. Furthermore, the knowledge gained from this research is beneficial in understanding whale biology and ecology.

4.6.4.2 Reasonably Foreseeable Future Effects

Research activities similar to those discussed above are expected to continue for the reasonably foreseeable future. NMFS-funded bowhead feeding ecology and aerial survey programs, and other scientific research activities are expected to contribute to cumulative effects within the EIS project area. In addition, Chukchi baseline studies funded by ConocoPhillips Alaska, Inc. (CPAI), Statoil, and Shell include physical oceanography, benthic, zooplankton, fish, acoustics, and ice studies in the Chukchi Sea. Likewise, BOEM has agreed to fund a comprehensive study of the Hanna Shoal ecosystem in the Chukchi Sea off Alaska's northwest coast. The BOEM study has a projected timeline of 2011-2016. NMFS will continue fisheries research activities in the Beaufort and Chukchi seas. Finally, National Science Foundation plans to conduct seismic surveys in northwest corner of U.S. EEZ, Chukchi Sea within the foreseeable future. Increased noise 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.

4.6.5 Other Development

4.6.5.1 Past and Present Effects

Other activities that may possibly contribute to the cumulative effects on bowhead whales include military activities, other industrial development, and tourism. With regard to military activities, the surface and airspace of the Chukchi and Beaufort seas are not extensively used for testing or training of aircraft, vessels, weapon systems, and personnel. Historically, military vessels or aircraft have not been stationed in the Beaufort or Chukchi seas. None of the airspace over the Beaufort and Chukchi seas is classified as 'special use airspace' for the military by the Federal Aviation Administration. Military vessels may occasionally transit through the area. 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 Defensive 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, although a few sites such as Cape Lisburne are still manned and receive resupply by air and sea. The U.S. Department of Defense is in the process of dismantling the abandoned sites.

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 activities are concentrated on land but may include the occasional use of marine vessels (such as small cruise ships) and aircraft. 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.

4.6.5.2 Reasonably Foreseeable Future Effects

Military activity in the Arctic is thought to have increased in recent years, and it may be 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. However, very little public information is available about future military activity in the region.

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.

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 at the present time. 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 4.6.5-1.

Table 4.6.5-1
Past, Present, and Reasonably Foreseeable Future Actions Related to Mining in the EIS Project Area

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

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.

4.6.6 Cumulative Effects of the Alternatives on Bowhead Whales

The major elements of cumulative effects on bowheads have been described above, primarily in terms of mortality and disturbance. The intent of this section is first to summarize the combined effects from factors other than subsistence whaling and then to assess the contribution of the alternatives to the overall cumulative effects on bowheads (for the direct and indirect effects of subsistence harvests under all three alternatives on bowhead whale populations, see Section 4.4.).

4.6.6.1 Anthropogenic Mortality from Sources other than Subsistence Whaling

Offshore oil and gas development would not be likely to contribute to mortality unless there was an oil spill (see below). 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 fairly 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 whales 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. The very low level of bowhead mortality from 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).

There is a low probability of a VLOS occurring, the consequences of which could be extensive. The potential for injury and mortality of bowheads and the magnitude of such impacts at the population level depend on the extent, location, and timing of a spill; ice/open water characteristics at the time of the spill and during subsequent response efforts; weather; cleanup efforts and persistence of oil and dispersants in the environment; and the presence of whales. The magnitude, geographic extent, and duration of this level of mortality are difficult to determine, but could range from negligible to major for the bowhead population (Table 4.1-1).

4.6.6.2 Disturbance from Sources other than Subsistence Whaling

Offshore petroleum exploration and development, shipping, fishing, research 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 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, for a rating of moderate. The duration of these effects is short-term, for a rating of minor. The overall effects of disturbance from sources other than subsistence whaling are unlikely to limit bowhead population growth, so are considered to be minor (Table 4.1-1).

In the unlikely event of a VLOS, 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 cause disturbance and displacement of bowhead whales. Displacement from migratory routes or feeding areas could result. Disturbance effects of activities associated with spill response, clean-up, and remediation would likely be temporary and non-lethal and are not expected to result in population level effects.

Climate change effects are difficult to predict, but are unlikely to disturb whales directly. Bowhead movement patterns and behavior may change relative to changes in sea ice distribution and zooplankton populations. While human sources of disturbance could serve to inhibit the use of some areas by bowheads, the retreat of sea ice due to climate change may enable bowheads to expand their range. 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. Whether this will add markedly to the minor level of disturbance noted above is uncertain.

4.6.6.3 Contribution of the Alternatives to Cumulative Effects

Alternative 1 would eliminate the federal quota for subsistence taking of bowhead whales and result in the elimination of subsistence whaling activities and harvest. The magnitude of direct mortality under this alternative is considered negligible to the population of bowheads. Human activities associated with subsistence whaling would be sharply reduced under this alternative, so the amount of noise and disturbance from subsistence whaling would be considered negligible. The cumulative effects of human activities other than subsistence whaling include were described and rated negligible to minor in the preceding sections. A VLOS is a low probability event, and as noted in Section 6.4.1.4, could have effects ranging up to major, if the spill occurred during a time when bowheads were present. Alternative 1 would contribute no mortality and disturbance to the cumulative effects on bowheads as previously described.

Alternative 2A would authorize a maximum annual mortality of up to 67 bowheads (assuming all strikes are lethal) for a five year period (up to 335 whales total), subject to a cap of 255 landed whales). Alternative 2B would authorize the same number of annual strikes as Alternative 2A, but for a six year period, for a potential total mortality of up to 402 whales subject to a cap of 306 landed whales (see Section 4.4 for more detailed discussion). This level of mortality is considered negligible at the population level for bowheads (Table 4.1-1). Except for a VLOS, mortality from sources other than subsistence whaling is also considered negligible (as described above), so the contribution of either Alternative 2A or 2B to cumulative effects on mortality would be considered negligible. Human activities associated with subsistence whaling under Alternatives 2A and 2B would vary from year to year and place to place depending on whale movements, weather, ice characteristics, and social factors. Disturbance to the whales from subsistence whaling activities under Alternative 2A or 2B would not affect the distribution of bowheads, and would be localized and short-term, so this is considered a minor impact to the population. Subsistence whaling activities would contribute on an annual, seasonal basis to the cumulative effects of disturbance from non-whaling activities. Except for the case of a VLOS, disturbance sources tend to be minor in magnitude, affecting a relatively small portion of the range of the population, or of short duration. Alternatives 2A and 2B make minor contributions to the cumulative effects of disturbance to bowhead populations from all sources, except for the case of a VLOS.

Assuming that all strikes are lethal, Alternative 3A would authorize a maximum mortality of 82 bowheads (strikes) for one year, if the authorized maximum carry-over of 15 unused strikes were to occur. This scenario would represent a potential total mortality of up to 350 whales over the five year period, subject to a cap of 255 landed whales. Alternative 3B would authorize the same number of annual strikes (mortality) as Alternative 3A, but for a six year period, for a potential total mortality of up to 417 whales, subject to a cap of 306 landed whales (see Section 4.4 for more detailed discussion). This level of mortality is considered negligible at the current population level for bowheads (Table 4.1-1). The cumulative effects analysis for Alternatives 3A and 3B is similar to that described for Alternatives 2A and 2B above, with a negligible contribution to cumulative effects through mortality and disturbance, except in the case of a VLOS.

The Western Arctic stock of 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 may have already been exposed to numerous disturbance events during their lifetimes. 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.

The potential effects of a VLOS (Section 4.6.1.4) could result in major cumulative effects of disturbance, injury, and mortality. This scenario would influence the context and contribution of Alternatives 2A and 2B and Alternatives 3A and 3B to cumulative effects on bowhead whales. The duration of effects from a VLOS on 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. 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. A VLOS is a low probability, high consequence event. If one were to occur and the timing and location were such that significant injury or mortality resulted, the added contribution of Alternatives 2A and 2B and 3A and 3B to cumulative effects could result in impact levels at the population level of minor for mortality, and minor to moderate for disturbance.

Also important for assessing cumulative effects on bowhead whales is the emerging dynamic of 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 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). Although current knowledge on the cumulative effects of climate change on bowhead whales is limited, it is likely that subsistence harvesting under Alternatives 2A and 2B and Alternatives 3A and 3B would make only a minor contribution to these cumulative effects.

4.7 Direct, Indirect, and Cumulative Effects on Other Wildlife

4.7.1 Direct and Indirect Effects on Other Wildlife

Alternative 1 would eliminate the federal quota for bowhead whales and result in the elimination of authorized subsistence whaling activities and harvest. 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 reductions in the populations of popular game species around the whaling communities. Hunting pressure on smaller game species might increase a small amount with minor effects on populations. Increased hunting activity would also increase noise and disturbance to game species and other wildlife. Since the loss of whaling would affect a number of communities, increased hunting disturbance would affect game populations 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 primarily 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 2A and 2B and Alternatives 3A and 3B 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. 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, bear, walrus, beluga whales, or Dall sheep. It is not possible to quantify this effect, as each subsistence food has its own individual value and place within the Alaska Eskimo 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.

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. Consultation is ongoing with NMFS regarding ESA listed species, ESA candidate species, and designated critical habitat under NMFS jurisdiction. In the May 2012 consultation letter, USFWS reviewed potential impacts to three species listed as threatened, namely Steller's eider, spectacled eider, and polar bear, as well as three candidate species, including yellow-billed loon, Kittlitz's murrelet, and Pacific walrus (USFWS, 2012; see Appendix 8.5). 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 under USFWS' jurisdiction, and that the proposed quota would have, at most, an insignificant effect on the listed and candidate species, and no significant effect on designated critical habitat.

4.7.2 Cumulative Effects of the Alternatives on Other Wildlife

4.7.2.1 Past and Present Effects

Chapter 3 describes a number of marine and terrestrial wildlife species that are present in the Alaskan coastal areas considered in this EIS. Some of these bird and mammal species are affected directly or indirectly by bowhead whaling activities:

- Disturbance (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 (gray whales, minke whales, killer whales, harbor porpoise, short-tailed albatross, and many terrestrial mammals) would incur only negligible, indirect effects from potential vessel or land travel disturbance associated with subsistence activities; these species will not be considered further in this EIS. Further consideration is given to Endangered Species Act (ESA) listed species (or those proposed for listing) for which the alternatives could contribute to cumulative effects.

Chapter 3 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 and vessels;
- Environmental contamination (air, water, and land) from distant industrial and agricultural sources;
- 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.

4.7.2.2 Reasonably Foreseeable Future Effects

All of the human activities and factors that have contributed to wildlife effects 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.

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 changes (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. Polar bears are now listed as threatened, walrus are candidate species for listing, and ringed and bearded seals are proposed for listing (73 FR 28212; 75 FR 77476; 75 FR 77496; 76 FR 7634).

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 land, 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 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.

4.7.2.3 Cumulative Effects on Other Wildlife

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 2A and 3A, and 2B and 3B would result in similar amounts of whaling activity and harvest over a five or six year period, although total take levels could vary slightly between these alternatives, due to differing provisions concerning carry-over of unused strikes. 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.

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. Alternative 2A and Alternative 3A would reauthorize the existing level of bowhead harvest, and Alternatives 2B and 3B would continue the existing level for an additional year (i.e., a 6 year period), so existing levels of subsistence harvest of other species would 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 would might be limited or suspended in areas impacted by a VLOS. Timing and location of such an incident would largely determine cumulative effects.

4.8 Direct, Indirect, and Cumulative Sociocultural Effects

4.8.1 Effects on Subsistence Patterns

The past, present, and future importance of the bowhead whale in these Eskimo 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). Eskimos 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 Barrow, Nuiqsut, and Kaktovik).

Bowhead whale meat and oil have long provided, and continue to provide, important contributions to the Eskimo diet. Bowhead meat 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, 2006c:167). A recent 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. 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 subsistence 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. 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 Eskimos (Michie, 1979).

4.8.1.1 Alternative 1 (No Action)

Under Alternative 1, there would be no federal authorization of subsistence bowhead whaling for the five years 2013 through 2017 or the six years 2013 through 2018. With no subsistence whaling, the direct effects of this alternative would include the loss of tens of thousands of pounds of 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 the opportunity 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.

Eskimo 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 Native rights of Alaska Eskimos. 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 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 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 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 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.

4.8.1.2 Alternative 2A

Alternative 2A would provide for continued subsistence bowhead whaling at a level that would address the identified Alaska Eskimo cultural and nutritional subsistence needs. However, Alternative 2 provides for no carry-over 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 2A would avoid the adverse reaction to no quota predicted under Alternative 1. With no carry-over of unused strikes, Alternative 2A would not provide the flexibility that whaling captains have been afforded for many years. 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 3.2.1-2). While the lack of this flexibility is a small adverse effect in subsistence patterns, overall the direct and indirect sociocultural effects of Alternative 2A are considered beneficial, and of major magnitude, extent, and duration.

The contribution to cumulative effects on subsistence harvest practices from Alternative 2A would be 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. 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 from industry. To minimize disturbances, CAAs, cooperative agreements negotiated between industry and the AEWC (MMS, 2006c:170), include provisions for whale observers and exclusion distances, ensuring that seismic activities are stopped when whales are in the vicinity.

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 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 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 CAAs create exclusion zones to avoid seismic activities 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 the deflection effects of noise associated with oil and gas activity are generally limited, though not completely known, and that the potential for disturbance to the whales and to subsistence whalers result in cumulative sociocultural effects that can be considered moderate in magnitude and extent, and minor in duration. The impact of a VLOS could be major on bowhead populations as noted in Section 4.6.6.1, and could result in reduced subsistence whaling opportunities. The contribution of Alternative 2A 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 allocation might be limited or eliminated, removing the beneficial effect.

4.8.1.3 Alternative 2B

Under Alternative 2B, the direct and indirect effects on subsistence harvest practices would be nearly identical to Alternative 2A (Section 4.8.1.2) but would extend for one additional year through 2018. Overall the direct and indirect sociocultural effects of Alternative 2B are considered beneficial, and of major magnitude, extent, and duration. The contribution of Alternative 2B to cumulative effects on subsistence patterns would be beneficial and would in part 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 discussed for Alternative 2A above.

4.8.1.4 Alternative 3A

Alternative 3A would provide for the same continuity in subsistence harvests and related social and cultural benefits as Alternative 2A. However, Alternative 3A would provide for the longstanding flexibility to carry-over up to 15 unused strikes into a subsequent year. In contrast to Alternative 2A, the carry-over feature of Alternative 3A 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 the following year through the carry-over of up to 15 unused strikes. Direct, indirect, and cumulative effects would be the same described for Alternative 2A. In total, the contribution of Alternative 3A to cumulative effects on subsistence patterns would be beneficial, and minor to major in magnitude, extent, and duration. Bowhead whaling with authorization under Alternative 3A 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 practices may be such that the beneficial effects of the subsistence bowhead whaling allocation could be limited.

4.8.1.5 Alternative 3B (Preferred Alternative)

Under Alternative 3B, the direct and indirect effects on subsistence harvest practices would be nearly identical to Alternative 3A (Section 4.8.1.4) but would extend for one additional year through 2018. Overall the direct and indirect sociocultural effects of Alternative 3B are considered beneficial, and of major magnitude, extent, and duration. The contribution of Alternative 3B to cumulative effects on subsistence patterns would be beneficial and minor to major in magnitude, extent, and duration, and this would in part offset any adverse effects of other activities on subsistence practices.

4.8.2 Effects on Eskimo Health and Public Safety

4.8.2.1 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 which 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 human 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 in 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 Yup'ik 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.

4.8.2.1.1 Alternative 1 (No Action)

Under Alternative 1, there would be no federal authorization of subsistence bowhead whaling for the five years 2013 through 2017 or the six years 2013 through 2018. 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, personal communication). In their view, this category of impacts has not previously been given sufficient attention.

Because it would affect a large portion of the all AEWC communities, the effects of Alternative 1 would be adverse and major in magnitude and geographic extent. The duration of these effects is not known, since the NMFS could revisit its decision in a subsequent year, or the decision to deny a quota could continue for the five year period similar to current authorizations, or for a six year period, if the amended schedule is adopted. In all, the effects of Alternative 1 on the nutrition and health would be adverse and major (Table 4.1-3).

4.8.2.1.2 Alternative 2A

Alternative 2A would reauthorize subsistence bowhead whaling at a level sufficient to address the identified Alaska Eskimo cultural and nutritional subsistence needs, with no provision for carry-over 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-over of unused strikes may make a very small difference in harvest levels. While carry-over provisions do provide flexibility to whaling captains late in the season, they have rarely been used. Since this alternative does reauthorize the subsistence hunt, the effects of Alternative 2A on nutrition and health would be positive and major in magnitude, extent, and duration, securing a substantial subsistence harvest opportunity for all AEWC communities for the next five years.

4.8.2.1.3 Alternative 2B

Under Alternative 2B, the direct and indirect effects on the nutritional level of subsistence users would be nearly identical to Alternative 2A but would extend for one additional year through 2018. Since the annual harvest rate is expected to remain the same under Alternative 2B, this extension would have no additional impact on the nutritional levels of subsistence users. As a result, the effects of Alternative 2B on nutrition and health would be positive and major in magnitude, extent, and duration, securing a substantial subsistence harvest opportunity for all AEWC communities for the next six years.

4.8.2.1.4 Alternative 3A

Alternative 3A would provide for the same continuity in subsistence harvests and related social and cultural benefits as Alternative 2A. The only difference is that Alternative 3A would continue the longstanding flexibility to carry-over up to 15 unused strikes into a subsequent year. The direct, indirect, and cumulative effects of Alternative 3A on health and nutrition are the same as those in Alternative 2A. The additional flexibility provided by the opportunity to carry-over 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-over 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 3A on nutrition and health would be positive and major in magnitude, extent, and duration, securing a major subsistence harvest opportunity for all AEWC communities for the next five years.

4.8.2.1.5 Alternative 3B (Preferred Alternative)

Under Alternative 3B (Preferred Alternative), the direct and indirect effects on the nutritional level of subsistence users would be nearly identical to Alternative 3A but would extend for one additional year through 2018. Since the annual harvest rate is expected to remain the same under Alternative 3B, this extension would have no additional impact on the nutritional levels of subsistence users. As a result, the effects of Alternative 3B on nutrition and health would be positive and major in magnitude, extent, and duration, securing a major subsistence harvest opportunity for all AEWC communities for the next six years.

4.8.2.2 Public Safety

Subsistence whaling carries a range of inherent risks, including the dangers of 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 Yup'ik 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 in eight foot swells and overnight. The mayor of Gambell, his two children, and another adult drowned, while two crew members 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 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 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, personal communication).

Injuries involving accidental discharge of harpoon bombs are reported in earlier decades. 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 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 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, personal communication).

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 significant dangers to the whaling crews (George et al., 2004b).

4.8.2.2.1 Alternative 1 (No Action)

Under Alternative 1 (No Action), there would be no federal authorization of subsistence bowhead whaling for the five years, 2013 through 2017. 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 would be minor to moderate in magnitude, because 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 extent, and since this would last for five years, this would be moderate in duration. In all, the direct, indirect, and cumulative effects of Alternative 1 on public safety would be beneficial and minor.

4.8.2.2.2 Alternative 2A

Alternative 2A would provide for subsistence bowhead whaling at a level that would address the identified Alaska Eskimo cultural and nutritional subsistence needs. However, Alternative 2A provides for no carry-over 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-over 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.

4.8.2.2.3 Alternative 2B

Under Alternative 2B, the direct and indirect effects on the public safety would be nearly identical to Alternative 2A but would extend for one additional year through 2018. Since the annual harvest rate and levels of risk inherent in bowhead whaling are expected to remain the same under Alternative 2B, this extension would have no additional impact on public safety. As a result, the effects of Alternative 2B on public safety would be minor in duration and frequency with provision regarding carry-over of unused strikes no appreciably affecting impacts.

4.8.2.2.4 Alternative 3A

Alternative 3A would provide for the same continuity in subsistence harvests and related social and cultural benefits as Alternative 2A. The only difference is that Alternative 3A would provide for the longstanding flexibility to carry-over up to 15 unused strikes into a subsequent year. 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 2A.

4.8.2.2.5 Alternative 3B (Preferred Alternative)

Under Alternative 3B (Preferred Alternative), the direct and indirect effects on public safety would be nearly identical to Alternative 3A but would extend for one additional year through 2018. Since the annual harvest rate and levels of risk inherent in bowhead whaling are expected to remain the same under Alternative 3B, this extension would have no additional impact on public safety.

4.8.3 Effects on Other Tribes and Aboriginals

The IWC provided for aboriginal groups to hunt whales in the original Schedule of Regulations 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 Eskimos 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 seeks and receives authorization from the IWC. Nonetheless, Canada has, since 1991, 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 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.

4.8.3.1 Alternative 1 (No Action)

Under Alternative 1, there would be no NMFS authorization of subsistence bowhead whaling for the five years, 2013 through 2017. If the Russian Federation did the same, the Chukotkan aboriginal people would also be denied a subsistence hunt. This would represent the loss 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 Eskimos, 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 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.

4.8.3.2 Alternative 2A

Alternative 2A 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 Eskimo groups. This alternative would also make it possible for the AEWC to carry on subsistence hunts that are sanctioned by the IWC. Official recognition that traditional subsistence activities, such as whale hunts, are culturally valuable will be reassuring to Native Americans in general. Thus, Alternative 2A would avoid the adverse, indirect effects of deterioration in working relations between NMFS and other tribes. Alternative 2A does not provide flexibility to the bowhead subsistence whalers in the form of carry-over 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 2A on other tribes would be negligible.

4.8.3.3 Alternative 2B

Under Alternative 2B, the direct, indirect, and cumulative effects on Alaska Eskimo groups would be nearly identical to Alternative 2A but would extend for one additional year through 2018. Since the annual bowhead harvest rate is expected to remain the same under Alternative 2B, this extension would allow AEWC communities to carry on subsistence hunts and would avoid deterioration of working relationships between NMFS and the tribes.

4.8.3.4 Alternative 3A

Alternative 3A provides for continuation of the current level of flexibility with carry-over of unused strikes, in that up to 15 can be carried into a subsequent year. The direct and indirect effects of this alternative on relations with other tribes are the same as those of Alternative 2A. The effects of Alternative 3 on other tribes would be negligible.

4.8.3.5 Alternative 3B (Preferred Alternative)

Under Alternative 3B, the direct, indirect, and cumulative effects on Alaska Eskimo groups would be nearly identical to Alternative 3A but would extend for one additional year through 2018. Since the annual bowhead harvest rate is expected to remain the same under Alternative 3B, this extension would allow AEWC communities to carry on subsistence hunts and would avoid deterioration of working relationships between NMFS and the tribes.

4.8.4 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.

4.8.4.1 Alternative 1 (No Action)

Under Alternative 1, there would be no federal authorization of subsistence bowhead whaling for the five years, 2013 through 2017. 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.

4.8.4.2 Alternative 2A

Alternative 2A 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-over 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-over of unused strikes are not likely to be consequential to the general public. The effects of Alternative 2A 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.

4.8.4.3 Alternative 2B

Under Alternative 2B, the direct and indirect effects on the general public would be nearly identical to Alternative 2A but would extend for one additional year through 2018. Since the annual harvest rate is expected to remain the same under Alternative 2B, this extension is not expected to alter the impacts to the general public highlighted in Alternative 2A.

4.8.4.4 Alternative 3A

Alternative 3A provides for the ongoing subsistence whaling allocation at a level that meets the identified need, and provides flexibility to whaling captains in that up to 15 unused strikes can be carried over to a subsequent year. The support and opposition to this alterative among the general public would be the same at that described for Alternative 2A. The effects of Alternative 3A 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.

4.8.4.5 Alternative 3B (Preferred Alternative)

Under Alternative 3B, the direct and indirect effects on the general public would be nearly identical to Alternative 3A but would extend for one additional year through 2018. Since the annual bowhead harvest rate is expected to remain the same under Alternative 3B, this extension is not expected to alter the impacts to the general public highlighted in Alternative 3A.

4.8.5 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 presented below in Section 4.8.5.1. The analysis of benefits and adverse effects on minority and low-income populations is presented in Section 4.8.5.2.

4.8.5.1 Affected Populations

The communities affected by the proposed action are the 11 member communities of the AEWC. As discussed in Section 3.4, Socioeconomic Environment, these are small, predominantly Alaska Native villages, with the exception that Barrow, as a regional service center, is larger and accounts for just over half of the regional population. In 2010 the AEWC member communities counted a total of 8,258 residents, of whom 6,674 or 80.8% are Alaska Native or part Alaska Native.

According to the 2005–2009 American Communities Survey 5-Year Estimate, the 11 AEWC member communities had generally high rates of residents living below the federally-defined poverty level. Three communities (Diomede, Gambell, and Savoonga) had comparatively high poverty rates, ranging from 41% through 59.1% of residents living below the poverty level. Six communities (Barrow, Wainwright, Point Lay, Kaktovik, Kivalina, and Wales) had intermediate rates, with 10% - 18% of residents below the poverty level. Two communities, Point Hope, and Nuiqsut, have low levels, with less than 9% of residents below the poverty level. All but two of these communities exceed the average rate of Alaska residents living below the poverty level, which is 9.6%, 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.

4.8.5.2 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 quota 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 disproportionate adverse effects, Alternative 1 would raise Environmental Justice concerns.

Alternatives 2A and 2B and Alternatives 3A and 3B would provide for an ongoing subsistence bowhead whaling quota, with variations in the provisions for carry-over of unused strikes into a subsequent year. 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 2A and 2B and Alternatives 3A and 3B would provide beneficial effects for the AEWC communities and do not raise environmental justice concerns that a minority population may be disproportionately impacted.

4.9 Summary of Effects

As presented in Chapter 2 of this document, five alternatives are analyzed in this EIS. Under Alternative 1, NMFS would not issue the AEWC a subsistence whaling quota for cultural and nutritional purposes. This could occur if, among other things, NMFS chose not to issue a quota based on environmental concerns.

Under Alternative 2A, NMFS would (through annual quotas) grant the AEWC an annual strike quota of 67 bowhead whales per year, subject to a total of 255 landed whales over the five years of 2013 through 2017. Under this alternative, no unused strikes from a previous year would be added to the quota for a subsequent year, notwithstanding the IWC's approval, in May 2007, of a carry-over of unused strikes in the bowhead subsistence quota.

Under Alternative 2B, NMFS would (through annual quotas) grant the AEWC an annual strike quota of 67 bowhead whales per year, subject to a total of 306 landed whales over the six years of 2013 through 2018. As with Alternative 2A, no unused strikes from a previous year would be added to the quota for a subsequent year, notwithstanding the IWC's approval, in May 2007, of a carry-over of unused strikes in the bowhead subsistence quota.

Under Alternative 3A, NMFS would (through annual quotas) grant the AEWC an annual strike quota of 67 bowhead whales per year (plus carry-over), subject to a total of 255 landed whales over the five years of 2013 through 2017. Under this alternative, up to 15 unused strikes from a previous year (including from the 2008 through 2012 quota block) could be added to the quota for a subsequent year, consistent with the IWC catch limits adopted in May 2007. A carry-over of up to 15 unused strikes was approved by the IWC in May 2007. A carry-over allows for variability in hunting conditions from one year to the next within limits that conserve the Western Arctic bowhead stock.

Under Alternative 3B (the proposed action), NMFS would (through annual quotas) grant the AEWC an annual strike quota of 67 bowhead whales per year (plus carry-over), subject to a total of 306 landed whales over the six years of 2013 through 2018. As with Alternative 3A, up to 15 unused strikes from a previous year (including from the 2008 through 2012 quota block) could be added to the quota for a subsequent year, consistent with the IWC catch limits adopted in May 2007.

The following tables (Tables 4.9-1 through 4.9-3) summarize the direct, indirect, and cumulative effects under 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 4.8.

Table 4.9-1
Summary of Direct, Indirect, and Cumulative Effects on Bowhead Whales

Effect		Alternative 1 No Action: Do Not Grant AEWC a Quota	Alternative 2A Grant AEWC Annual Quotas (67 Strikes) for 5 years with No Unused Strikes Carried Over	Alternative 2B Grant AEWC Annual Quotas (67 Strikes) for 6 years with No Unused Strikes Carried Over	Alternative 3A Grant AEWC Annual Quotas (67 Strikes) for 5 years with No More Than 15 Unused Strikes Carried Over Any One Year	Alternative 3B (Preferred Alternative) Grant AEWC Annual Quotas (67 Strikes) for 6 years with No More Than 15 Unused Strikes Carried Over Any One Year
Direct and Indirect Effects	Mortality	No impact.	Negligible impact to bowhead whale populations.	Bowhead whales – (Same as Alternative 2A)	Bowhead whales – (Same as Alternative 2A)	Bowhead whales – (Same as Alternative 2A)
	Disturbance	No impact.	Impacts of noise and disturbance under this alternative would be minor in magnitude, extent, and duration.	Bowhead whales – (Same as Alternative 2A)	Bowhead whales – (Same as Alternative 2A)	Bowhead whales – (Same as Alternative 2A)
Cumulative Effects		No direct or indirect impacts of alternative. Cumulative effects to mortality would be negligible in magnitude, extent, and duration. Cumulative effects to disturbance would be minor in magnitude, extent and duration. A very large oil spill is a low probability event, but could have major effects if the spill occurred during a time when bowheads were present. Alternative 1 would not contribute to mortality or disturbance.	Direct and indirect effects of alternative two would have negligible impacts on mortality and disturbance of bowheads. Cumulative effects to mortality would be negligible in magnitude, extent, and duration. Cumulative effects to disturbance would be minor in magnitude, extent, and duration, at the population level. A very large oil spill is a low probability event, but could have major effects if the spill occurred during a time when bowheads were present. Alternative 2 would make a minor contribution to cumulative levels of mortality and a minor to moderate contribution to cumulative effects of disturbance.	Bowhead whales – (Same as Alternative 2A)	Bowhead whales – (Same as Alternative 2A)	Bowhead whales – (Same as Alternative 2A)

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Table 4.9-2
Summary of Direct, Indirect, and Cumulative Effects – Other Wildlife

Effect		Alternative 1 No Action: Do Not Grant AEWC a Quota	Alternative 2A Grant AEWC Annual Quotas (67 Strikes) for 5 years with No Unused Strikes Carried Over	Alternative 2B Grant AEWC Annual Quotas (67 Strikes) for 6 years with No Unused Strikes Carried Over	Alternative 3A Grant AEWC Annual Quotas (67 Strikes) for 5 years with No More Than 15 Unused Strikes Carried Over Any One Year	Alternative 3B (Preferred Alternative) Grant AEWC Annual Quotas (67 Strikes) for 6 years with No More Than 15 Unused Strikes Carried Over Any One Year
Direct and Indirect Effects	Mortality	Direct and indirect effects on mortality would be minor to moderate in magnitude, extent, and duration.	This alternative would have negligible to minor direct and indirect effects on mortality.	Same as Alternative 2A	Same as Alternative 2A	Same as Alternative 2A
	Disturbance	Direct and indirect effects on disturbance would be minor to moderate in magnitude, extent, and duration.	This alternative would have negligible to minor direct and indirect effects on disturbance.	Same as Alternative 2A	Same as Alternative 2A	Same as Alternative 2A
Cumulative Effects		The contribution of Alternative 1 to cumulative effects would be moderate for important game species (e.g., caribou) and minor for other species.	The contribution of Alternative 2 to cumulative effects would be negligible.	Same as Alternative 2A	Same as Alternative 2A	Same as Alternative 2A

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Table 4.9-3
Summary of Direct, Indirect, and Cumulative Effects – Socio-cultural Environment

Effect		Alternative 1 No Action: Do Not Grant AEWC a Quota	Alternative 2A Grant AEWC Annual Quotas (67 Strikes) for 5 years with No Unused Strikes Carried Over	Alternative 2B Grant AEWC Annual Quotas (67 Strikes) for 6 years with No Unused Strikes Carried Over	Alternative 3A Grant AEWC Annual Quotas (67 Strikes) for 5 years with No More Than 15 Unused Strikes Carried Over Any One Year	Alternative 3B (Preferred Alternative) Grant AEWC Annual Quotas (67 Strikes) for 6 years with No More Than 15 Unused Strikes Carried Over Any One Year
Direct and Indirect Effects	Effects on Subsistence	Direct and indirect effects on subsistence are adverse, and would be major in magnitude and extent, but of unknown duration.	Direct and indirect effects on subsistence are positive and would be major in magnitude, extent, and duration.	Same as Alternative 2A	Same as Alternative 2A	Same as Alternative 2A
	Effects on public health and safety	Direct and indirect effects on public health are adverse, and would be major in magnitude and extent, but of unknown duration. The effects on safety would be minor.	Direct and indirect effects on public health and safety are positive and would be major in magnitude, extent, and duration.	Same as Alternative 2A	Substantially similar to Alternative 2A; however, the ability to carry over unused strikes would result in greater temporal flexibility in subsistence effort and beneficial effects to public safety.	Substantially similar to Alternative 2A; however, the ability to carry over unused strikes would result in greater temporal flexibility in subsistence effort and beneficial effects to public safety.
Cumulative Effects		The contribution of Alternative 1 to cumulative effects on subsistence practices and nutrition and health would be adverse and major in magnitude, extent, and duration. This alternative makes a minor contribution to the cumulative effects on public safety.	The contribution of Alternative 2 to cumulative effects on subsistence harvest practices would be beneficial and major in magnitude, extent, and duration. Overall cumulative effects on subsistence harvest practices would be adverse and minor to moderate depending upon the timing and location of oil and gas activities and the efficacy of measures intended to mitigate such 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 of the subsistence bowhead whaling allocation.	Same as Alternative 2A	Same as Alternative 2A	Same as Alternative 2A

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5.3 Contributors

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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 Endangered Species Act (ESA). However consultation under Section 7 of the ESA is required.

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 the May 2012 consultation letter, concluded that the proposed annual quotas for bowhead subsistence harvests are unlikely to adversely affect species under USFWS' jurisdiction, and that the proposed quota would have, at most, an insignificant effect on the listed and candidate species, and no significant effect on designated critical habitat (USFWS, 2012; Appendix 8.5). The letter noted that subsistence bird harvests can occur during the whale hunt, including takes of some listed and candidate species which are closed to harvest under the Migratory Bird Treaty Act. USFWS reviews the take of listed in species in a separate Biological Opinion on the Migratory Bird Subsistence Harvest Regulations. The May 2012 letter concluded the ESA consultation with USFWS.

A Biological Opinion concerning the proposed action to issue annual quotas authorizing the harvest of bowhead whales to the Alaska Eskimo Whaling Commission (AEWC) for the period of 2013 through 2017 or 2018 will be prepared. This will conclude the consultation with NMFS concerning ESA listed species.

The AEWC was consulted 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.

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8.0 APPENDICES

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8.1 Quantification of Subsistence and Cultural Need for Bowhead Whales by Alaska Eskimos

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QUANTIFICATION OF SUBSISTENCE AND CULTURAL NEED FOR BOWHEAD WHALES BY ALASKA ESKIMOS

2012 Update Based on 2010 U.S. Census Data

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May 2012

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LIST OF ACRONYMS

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IWC	International Whaling Commission
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QUANTIFICATION OF SUBSISTENCE AND CULTURAL NEED FOR BOWHEAD WHALES BY ALASKA ESKIMOS

2012 Update Based on 2010 U.S. Census Data

INTRODUCTION

This document is similar to the previously prepared *2007 Update Based on 2000 U.S. Census Data* (Stephen R. Braund & Associates [SRB&A] 2007) and is submitted at this time to provide a current (2012) subsistence and cultural need statement. This needs assessment relies on the 2010 U.S. Census. Thus, the quantification of subsistence and cultural need for bowhead whales by Alaska Eskimos has been updated with 2010 population information.

In previous subsistence and cultural needs assessments submitted to the International Whaling Commission (IWC) for years between the decennial U.S. Census, including the 2007 report, the calculation depended on the most current Alaska Department of Labor Data population estimates for the communities multiplied by the percent Native from the 1980 and 1990 U.S. Census. However, the most reliable information for assessing subsistence and cultural need using the IWC accepted method is to rely on the U. S. Census. Thus, the 2012 needs assessment is based on the 2010 U.S. Census.

Like the 2002 and 2007 reports, this document is intended to be an addendum to the *Quantification of Subsistence and Cultural Need for Bowhead Whales by Alaska Eskimos - 1997 Update Based on 1997 Alaska Department of Labor Data* (SRB&A 1997). The 1997 report should be read in conjunction with this document as the former report provides relevant discussion and references for the historic context of this report. That discussion is not repeated in this brief report. In addition, for full discussion of the research on historical whaling and human population data that formed the basis of the calculation of subsistence and cultural need, see Braund, Stoker and Kruse (1988).

This report provides the eighth calculation of subsistence and cultural need for bowhead whales by Alaska Eskimos and is based on the same methodology used in the previous seven "needs" assessments. The first calculation of subsistence and cultural need submitted to the IWC 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. This 2012 report, that uses the 2010 U.S. Census data, is the fourth time since 1983 that U.S. Census data have been used for the Alaska Eskimo needs calculation. All of the calculations of need since 1988 utilize the same method that was accepted by the IWC in 1986.

2012 UPDATE BASED ON 2010 U.S. CENSUS DATA

In preparation for the June/July 2012 IWC meeting, the AEWC requested an update of cultural and subsistence need for bowhead whales. Because the most reliable population information is from the U.S. census, this update is based on the 2010 U.S. Census data for the 11 Alaska bowhead whaling communities. Since the previous needs assessment, Point Lay has been added as an Alaska bowhead whaling community (SRB&A 2008). The 2010 U.S. Census has race information, and the Alaska Native population in each of the whaling communities is reported. For this reason, the 2010 U.S. Census is used for the 2012 needs update, rather than more current Alaska State Demographer population estimates that require an additional estimate of the percent American Indian of the state estimates.

Applying the IWC accepted method of calculating need (see Braund, Stoker and Kruse 1988), SRB&A updated need based on 2010 U.S. Census data. Other than the additional communities (i.e., Little Diomede and Point Lay), the only variable that has changed since 1988 for this calculation is the Alaska Native population for the 11 whaling communities. Only the Native population of each community is considered. The 2010 U.S. Census Alaska Native population data represent "American Indian or Alaska Native alone or in combination with one or more other races."

Based on 2010 U.S. Census data, the number of bowheads needed by each community and by the region as a whole (all 11 communities) is derived by multiplying the mean number of whales landed per capita over the base time period (1910-1969) by the 2010 Alaska Native population for each community and for the region as a whole. Using this method, the need for each community is shown on Table 1. Based on the 2010 census data, the cultural and subsistence need in the 11 Alaska Eskimo communities is 55 landed bowhead whales (58 if rounded up and summed for each community). In 1997 the need was 54 landed bowheads (56 rounded up), and in 2002 and 2007, it was 56 landed bowheads (56 and 58 landed bowheads rounded up respectively). Applying the mean of .008515 bowhead landed per capita for all 11 communities for the historical period (1910-1969) to the 2010 regional Native population of 6,674 results in a 2010 **regional** cultural and subsistence need of 57 landed bowhead whales. In 1997, this regional calculation was 56 landed bowhead whales and in 2002 and 2007, it was 57 landed bowhead whales.

Table 1: Eleven Alaska Eskimo Whaling Villages' Subsistence & 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
Barrow	60	44,687	379	0.008481	2889	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

[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, Barrow'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 2010 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 Barrow 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).

Stephen R. Braund & Associates, 2012.

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QUANTIFICATION OF SUBSISTENCE AND CULTURAL NEED FOR BOWHEAD WHALES BY ALASKA ESKIMOS

1997 Update Based on 1997 Alaska Department of Labor Data

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13 October 1997

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QUANTIFICATION OF SUBSISTENCE AND CULTURAL NEED FOR BOWHEAD WHALES BY ALASKA ESKIMOS

1997 Update Based on 1997 Alaska Department of Labor Data

INTRODUCTION

Inupiat and Yup'ik Eskimos of Alaska have hunted bowhead whales for over 2,000 years as the whales migrate near the communities in the spring and fall. Hunting bowhead whales in Alaska remains a communal activity that supplies important meat and maktak for the entire community as well as for feasts and ceremonies. Formalized patterns of hunting, sharing, and consumption characterize the modern bowhead harvests. Of all subsistence activities in these communities, bowhead whaling represents one of the greatest concentrations of effort, time, money, group symbolism, and significance. In addition to providing a major source of food, bowhead whaling is a large part of these communities' cultural tradition and their modern cultural identity (Braund and Moorehead 1995).

Since the early 1980s, the International Whaling Commission (IWC) has determined the quota for Alaska Eskimo bowhead whale harvests in part by considering the subsistence and cultural need for bowhead whales by Alaska Eskimos. In 1986, the IWC adopted the only method used to date to calculate subsistence and cultural need. This method incorporates the historic and current size of the Eskimo population residing in Alaskan whaling villages and the number of bowhead whales historically landed by each community. Because bowhead whaling is a community-wide activity, it is appropriate to consider the community population in association with the historic harvest levels. Besides abundance of bowhead whales, community population levels are a critical factor that influences harvests because the community population dictates the number and size of whaling crews and the amount of meat and maktak needed to feed the community, share with others, and provide for ceremonial feasts.

The first calculation of subsistence and cultural need submitted to the IWC 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 (Stephen R. Braund & Associates [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). This, the fifth calculation (and fourth presented to the IWC) utilizes the same method accepted by the IWC in 1988 for calculating need, presenting revised calculations based on July 1, 1997 population data generated by the State of Alaska, Department of Labor.

REVIEW OF THE 1988 STUDY

The objective of the 1988 study was to quantify the cultural and subsistence need for bowhead whales by Alaska Eskimos (Braund, Stoker and Kruse 1988). We viewed cultural and subsistence need as independent of any biological assessment of bowhead populations and as only one of two parts of any quota request the U.S. government made to the International Whaling Commission (the second part being the biological assessment). Prior to 1988, the estimation of cultural need for bowhead whales by Alaska Eskimos had been based on the historic relationship between the size of the Eskimo population residing in Alaskan whaling villages and both the number of bowhead whales historically landed and the number of crews engaged in whaling (U.S. Government 1983). Based on data available in 1983, the cultural need for bowhead whales was established at 26 bowheads landed per year for the nine Alaska bowhead whaling communities. Assuming 75 percent efficiency, 26 landed converted to 35 strikes requested by the U.S. government at the 1983 IWC meeting. At that time, we knew the historical data on bowhead landings and Eskimo population were incomplete. Furthermore, the Alaska Eskimo whaling community believed that the cultural need for bowheads had been seriously underestimated.

NEW SOURCES OF DATA FOR THE 1988 STUDY

The new sources of data for the 1988 analysis included additional landed bowhead data and Eskimo population data.

Bowheads Landed

The study team began with the lists of landed bowheads in Marquette and Bockstoce (1980) that provided, by location, the number of crews, bowheads landed, struck and lost, killed but lost, and total bowheads killed. Additional research to make this list more complete included hiring Bockstoce and Marquette to make additions they had learned about since 1980, performing additional archival research based on both published and unpublished information (whale ship logs, teacher reports, diaries, magazines, newspapers, books, reports, etc.), researching in libraries and archives throughout the U.S., and performing fieldwork in Wainwright, Wales, Gambell and Savoonga in November and December 1987.

This research resulted in a new, longer list of bowhead landed data for 21 different locations in Alaska representing 1) historic but not current human settlements, 2) traditional whaling sites occupied seasonally, and 3) existing communities (Braund, Marquette and Bockstoce 1988). The bowhead harvest data were presented by each specific location where the activity took place from pre-1900 to 1977. The Scientific Committee reviewed and accepted the new landed data in 1988 (IWC 1989:49).

Next, we consolidated the whale harvest data from the 21 locations within the nine Alaska Eskimo communities that currently participate in bowhead whaling (e.g., whales harvested at Icy Cape, Point Belcher and Point Franklin were attributed to Wainwright, whales harvested at Cape Halkett and Cross Island/Prudhoe Bay were consolidated with Barrow). Hence, eight of the 21 locations were reassigned or consolidated with these nine communities. The last five locations (Little Diomede, King Island, Point Lay, Shaktoolik, and "unlocated") were not included in the analysis.

The reasons for consolidation included 1) the centralization into larger communities such that most of the people who lived and whaled at the smaller sites became residents of the nearby larger villages, and 2) residents of the nine active communities traditionally traveled to many smaller sites on a seasonal basis to hunt bowheads.

Next, the study team linked human population by consolidated location to whale hunting activity from 1910 to 1969. Thus, the human population per year by consolidated location (i.e., the nine whaling villages) was linked to whale hunting activity from 1910 to 1969. In this way, we were able to examine the relation between human population and bowhead harvest data.

Eskimo Population

The second source of new data for the 1988 analysis was more detailed information on the Eskimo population. The 1983 calculation of cultural need for bowheads was based on available decennial census population counts. In order to formally examine the relationship between bowhead landings and human population, however, it was necessary to have annual human population counts which could be compared to the number of bowheads landed on a village basis. Instead of simply assuming a uniform rate of change in population between census counts or assuming a continuation of present growth rates, the study team constructed a human population model incorporating data on 1) age and sex distributions; 2) birth rates; and 3) death rates.

1988 RESULTS: RECALCULATION OF CULTURAL NEED FOR BOWHEAD WHALES

Revision of Historical Base Period

As mentioned above, the 1983 calculation of cultural need was constrained by lack of data. The starting point for the base period used in 1983 varied by village from 1940 to 1950. The end point was uniformly 1970. Additional data gathered for this study and study team members' knowledge of the prevalent living conditions between 1940 and 1970 led the study team to conclude that the most appropriate base period was the 60 year period from 1910 to 1969.

The beginning year of 1910 was selected because data prior to 1900 becomes increasingly sporadic and unreliable related to both bowhead landed and human population, and commercial whaling had an effect on the number of whales landed at certain villages (especially Gambell, Point Hope, and Barrow). Commercial whaling ceased in 1909 so 1910 begins a period free of commercial influence.

The two or three decades after the end of commercial whaling represent a significant period of heavy reliance on subsistence for the northern Alaska Eskimo. Conditions changed dramatically in the 1940s as military activities and government programs exerted strong influences on local lifestyles. The period 1940 to 1969 can be characterized as a time of increased local employment that conflicted with subsistence activities and of religious and government pressures to abandon traditional lifestyles. Despite these influences, the Eskimo continued to demonstrate an active interest in subsistence whaling. The year 1969 was chosen as the end of the base period because the period from 1970 to 1977 was a time of considerable economic change and cultural revival in the villages. These years (1970 to 1977) represent a time of increase in bowhead whaling effort, in the number of whales taken, and the number of whales struck and lost (Marquette and Bockstoce 1980). Hence, to avoid the influence of this increased harvest period, the study team chose to end the base period in 1969.

1988 Estimation of Cultural Need Based on the Relationship Between Bowheads Landed and Eskimo Population

Table 1 presents the recalculated cultural need for bowhead whales based on the IWC accepted method. The data base included 250 observations matching the Eskimo population with bowhead landed at the community level. As shown in the table, substantial landed whale data were compiled for the 60 year period (1910 to 1969) for Gambell (39 years), Point Hope (50 years), Wainwright (49 years), and for Barrow (60 years).

In Table 1, the number of bowheads needed by each community and by the region as a whole was derived by multiplying the mean number of whales landed per capita over the time period selected (1910 to 1969) by the best estimate of current human population for these communities and the region. "Current" population data was the most recent data available at the time, ranging from 1983 data for three villages, 1985 data for one village, 1986 data for two villages, to 1987

Table 1: Alaska Eskimo Whaling Communities' Subsistence and Cultural Need For Landed Bowhead Whales, 1988.\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	1983-87 Eskimo Population\6	1987 Bowhead Need (Landed)\7	1987 Need (Landed) (Rounded)\8
Gambell	39	11,883	68	0.005722	495	2.8	3
Savoonga \9	0	—	—	0.005722	485	2.8	3
Wales	42	6,907	5	0.000724	154	0.1	1
Kivalina	7	926	3	0.003240	275	0.9	1
Point Hope	50	12,467	209	0.016764	534	9.0	9
Wainwright	49	10,723	108	0.010072	445	4.5	5
Barrow	60	44,687	379	0.008481	1,823	15.5	16
Nuiqsut \9	0	—	—	0.008481	227	1.9	2
Kaktovik	3	327	3	0.009174	154	1.4	1
Totals	250	87,920	775		4,592	38.8	41
Region\10	250	87,920	775	0.008815	4,592	40.5	41

\1 Subsistence and cultural need is based on historic per capita harvest per community multiplied by present village population.
\2 The number of observations represents the number of years for which data on landed whales were available for each community (See Appendices 1 and 2 in Braund, Stoker and Kruse 1988).
\3 Total Eskimo population represents the sum of the Eskimo population for each year there was an observation of a landed bowhead whale.
\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 and 2 in Braund, Stoker and Kruse 1988). The sum of the total Eskimo population was calculated by adding the population estimates for each village for each year that there was a landed whale observation. For example, Barrow's 379 landed whales from 1910-1969 were divided by the total Eskimo population sum of 44,687 for this 60 year period (i.e., 379 divided by 44,687 = .008481).
\6 See Table 7 (in Braund, Stoker and Kruse 1988) for the source of Eskimo population data for each community.
\7 The number of bowheads needed is derived by multiplying the mean per capita landed whales (1910-1969) by the most current Eskimo population figure available for each community.
\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 neither Nuiqsut nor Savoonga between 1910-1969, the mean per capita landed whales for Gambell was used for Savoonga and the mean for Barrow was used for Nuiqsut.
\10 The mean per capita landed whales for the region represents the total number of whales landed for all communities between 1910 and 1969 divided by the sum of the total Eskimo population for all communities for each year landed whale data existed between 1910 and 1969 (i.e., 775 whales divided by 87,920 = .008815).

Source: Stephen R. Braund & Associates, 1988.

Stephen R. Braund & Associates, 1997.

population data for three villages. The mean number of whales landed per capita over the time period was calculated from the total number of whales landed between 1910 and 1969 for each community (and for the region as a whole) divided by the total human population, by community and region, summed over all the years for which landed whale data exist between 1910 and 1969. In other words, the total human population by village and region is the sum of all village population estimates for years in which whales were landed. This sum was divided into the total landed whales in each community. Based on a mean of .008815 bowhead landed per capita from 1910 to 1969, the 1988 cultural need was 41 landed bowhead whales.

1992 UPDATE BASED ON 1990 U. S. CENSUS

In 1992, the Alaska Eskimo Whaling Commission (AEWC) asked Stephen R. Braund and Associates (SRB&A) to update the cultural and subsistence need for bowhead whales by nine Alaska Eskimo whaling communities based on more current human population data for the communities. Applying the same IWC accepted method of calculating need as used in the 1988 report (Braund, Stoker and Kruse 1988), SRB&A updated need based on 1990 U.S. Census data (see Stephen R. Braund & Associates 1992). The only variable that had changed for this calculation was the Alaska Native population for the nine whaling communities. The 1988 report was written between U.S. decennial census counts and current U.S. census data were not available. For the 1992 update, the 1990 U.S. Census data for each community was used (Alaska Department of Labor 1991). Only the Native population of each community was considered. Based on the 1990 census data, the cultural and subsistence need in the nine Alaska Eskimo communities was 47 landed bowheads (excluding Little Diomede; for a discussion of Little Diomede Island bowhead whaling, see Stephen R. Braund & Associates 1991).

1994 UPDATE BASED ON 1992 ALASKA DEPARTMENT OF LABOR DATA

In 1994, the Alaska Eskimo Whaling Commission again requested an update of cultural and subsistence need for bowhead whales, as the 1990 U.S. Census data were nearly four years old. Because the next U.S. census would not be conducted until the year 2000, the study team reviewed the available sources for current population data.

The Alaska Department of Labor (ADOL) makes annual population estimates for each incorporated community in Alaska for purposes of municipal planning. For 1992, ADOL made these estimates based on the relationship of the 1990 U.S. Census data to the 1990 Alaska Permanent Fund applications for each community. Using this relationship as the base period, ADOL estimated the 1992 community population by knowing the number of 1992 Permanent Fund applications and solving for the 1992 population (Personal communication, J. Gregory Williams April 28, 1994). In addition, the ADOL reviewed other information to ensure the accuracy and consistency of their population estimates. These additional analyses included a similar computation for each community using school enrollment information and a careful review of rural public health nurse records in each community.

The study team reviewed these population data for the 10 Alaska bowhead whaling communities recognized by the AEWC (Alaska Dept. of Labor, Research Analysis 1994).[1] Because these data were not broken down by race, they represented the total population (Alaska Native and other races) for each location. The method accepted by the IWC for calculating need depends on having population data on Alaska Natives only. In order to disaggregate the population data by race, the study team relied on the Alaska State Demographer who provided information on the percentage of Natives in each of the ten communities based on both school enrollment and the 1990 U.S. Census (SRB&A 1994 Table 2). As suggested by the Alaska State Demographer, the study team used the 1990 percent Native American figures and applied these percentages to the 1992 population estimates to arrive at the Native population for the communities.

Using the 1992 total population estimates provided by the Alaska Department of Labor and applying the percentage Native from the 1990 U.S. Census resulted in a 1992 cultural and subsistence need of 51 landed bowhead whales for the 10 communities (SRB&A 1994, Table 3).

1997 UPDATE BASED ON 1997 ALASKA DEPARTMENT OF LABOR DATA

In preparation for the 1997 IWC meeting, the Alaska Eskimo Whaling Commission requested an

[1] This analysis includes population data for the village of Little Diomede. For a discussion of Little Diomede Island bowhead whaling, see Stephen R. Braund & Associates 1991.

update of cultural and subsistence need for bowhead whales. By 1997, the 1994 update was based on the five year old 1992 population information. The Alaska State Demographer (ADOL 1997a) provided population estimates for each year from the 1990 U.S. Census (Table 2). These updates are prepared annually and include the total population (Native and other) in each of the communities. To arrive at the Native population only, the percent Native American from the 1990 U.S. Census was applied to the annual population data (Table 3). This resulted in an estimated Native population for the ten Alaska bowhead whaling communities.

Using the 7/1/97 total population estimates provided by the Alaska Department of Labor and applying the percentage Native from the 1990 U.S. Census, Table 4 presents the 1997 cultural and subsistence need for bowhead whales in the ten Alaska Eskimo communities. The number of bowheads needed by each community and by the region as a whole (all ten communities) is derived by multiplying the mean number of whales landed per capita over the base time period (1910-1969) by the estimated 1997 Alaska Native population for each community and for the region as a whole. Using this method, the need for each community is shown on Table 4. Applying the mean of .008621 bowhead landed per capita for all ten communities for the historical period (1910-1969) to the estimated 1997 regional Native population of 6,472 results in a 1997 regional cultural and subsistence need of 56 landed bowhead whales.

Table 5 compares the ten Eskimo whaling communities' need in the mid-1980s (i.e., based on 1983-87 Alaska Native population estimates in each community) with the need in 1990, 1992, and 1997. The landed need increased from 41 landed in the mid-1980s (not including Little Diomede Island) to a need of 48 landed based on the 1990 U.S. Census data to 51 landed in 1992 and 56 landed in 1997. The 1990, 1992 and 1997 landed need figures include Little Diomede Island.

Table 6 compares the mid-1980s Alaska Native population for each community with Native population of 1990, 1992 and 1997 (the four years when new population data were gathered to

Table: 2	Total Estimated Population of Ten Alaska Eskimo Bowhead Whaling Communities.\1,2							
Community\3,4	**4/1/90**	**7/1/91**	**7/1/92**	**7/1/93**	**7/1/95**	**7/1/95**	**7/1/96**	**7/1/97**
Gambell	525	551	579	586	616	622	636	653
Savoonga	519	543	562	573	571	603	612	622
Wales	161	158	162	156	162	174	166	162
Diomede\5	178	175	181	177	170	154	171	174
Kivalina	317	331	370	366	376	348	353	357
Point Hope	639	668	685	676	709	719	756	749
Wainwright	492	497	531	536	537	535	560	550
Barrow	3,469	3,609	3,778	3,897	4,055	4,197	4,257	4,380
Nuiqsut	354	387	422	403	411	412	427	435
Kaktovik	224	218	215	211	208	212	221	222
Totals	6,878	7,137	7,475	7,581	7,815	7,976	8,159	8,304

\1 Population numbers represent total community population.
\2 The 1992 population data presented in this table reflect minor differences with the 1992 population data presented to the IWC in 1994 (IWC/46/AS6) due to revisions in national and state populations by the U.S. Census Bureau. The demographer's annual update to the Alaska population data results in minor readjustments to previous years' population data back to 1990. Thus, there are minor differences in the 1992 population data as reported in 1994 compared to the 1992 data reported in 1997. These differences do not change the outcome of the needs calculation.
\3 1990 population data from the 1990 U.S. Census.
\4 1991-1997 population data are from the Alaska Department of Labor, Research & Analysis Section, 1997a.
\5 Little Diomede Island was granted membership into the AEWC in 1988.

Table: 3	Estimated Native Population of Ten Alaska Eskimo Bowhead Whaling Communities, 1997.\1,2								
Community	**Percent Native American\3**	**4/1/90**	**7/1/91**	**7/1/92**	**7/1/93**	**7/1/94**	**7/1/95**	**7/1/96**	**7/1/97**
Gambell	96.19%	505	530	557	564	593	598	612	628
Savoonga	95.18%	494	517	535	545	543	574	583	592
Wales	88.82%	143	140	135	139	144	155	147	144
Diomede	93.82%	167	164	170	166	159	144	160	163
Kivalina	97.48%	309	323	361	357	367	339	344	348
Point Hope	91.86%	587	614	629	621	651	660	694	688
Wainwright	94.31%	464	469	501	506	506	505	528	519
Barrow	63.91%	2,217	2,307	2,415	2,491	2,592	2,682	2,721	2,799
Nuiqsut	92.66%	328	359	391	373	381	382	396	403
Kaktovik	84.38%	189	184	181	178	176	179	186	187
Totals		5,403	5,605	5,874	5,939	6,112	6,218	6,372	6,472

\1 The 1992 population data presented in this table reflect minor differences with the 1992 population data presented to the IWC in 1994 (IWC/46/AS6) due to revisions in national and state populations by the U.S. Census Bureau. The demographer's annual update to the Alaska population data results in minor readjustments to previous years' population data back to 1990. Thus, there are minor differences in the 1992 population data as reported in 1994 compared to the 1992 data reported in 1997. These differences do not change the outcome of the needs calculation.
\2 Based on Percent Native American from the 1990 U.S. Census.
\3 From 1990 U.S. Census data.

Stephen R. Braund & Associates, 1997.

Table 4: Ten Alaska Eskimo Whaling Villages' Subsistence and Cultural Need For Landed Bowhead Whales, 1997.\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	1997 Alaska Native Population\6	1997 Bowhead Need (Landed)\7	1997 Need (Landed) (Rounded)\8
Gambell	39	11,883	68	0.005722	628	3.6	4
Savoonga \9	0	—	—	0.005722	592	3.4	3
Wales	42	6,907	5	0.000724	144	0.1	1
Diomede \10	30	3,250	11	0.003678	163	0.6	1
Kivalina	7	926	3	0.003240	348	1.1	1
Point Hope	50	12,467	209	0.016764	688	11.5	12
Wainwright	49	10,723	108	0.010072	519	5.2	5
Barrow	60	44,687	379	0.008481	2,799	23.7	24
Nuiqsut \9	0	—	—	0.008481	403	3.4	3
Kaktovik	3	327	3	0.009174	187	1.7	2
Totals	280	91,170	786		6,472	54.4	56
Region\11	280	91,170	786	0.008621	6,472	55.8	56

\1 Subsistence and cultural need is based on historic per capita harvest per community multiplied by the 1997 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).

\3 Total Eskimo population represents the sum of the Eskimo population for each year there was an observation of a landed bowhead whale.

\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 and Tables 1 and 3 in Stephen R. Braund & Assoc. 1991). 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, Barrow'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 1997 Alaska Native population data for each community are from the Alaska Department of Labor, Research & Analysis Section (1997a) 7/1/97 population estimates of these 10 communities multiplied by the percent Native American in each community from the 1990 U.S. Census. J. Gregory Williams, State Demographer, 10/6/97 and 1990 U.S. Census.

\7 The number of bowheads needed is derived by multiplying the mean per capita landed whales (1910-1969) by the 1997 Alaska Native population for each community.

\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 Barrow 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 ten 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., 786 whales divided by 91,170 = .008621).

Stephen R. Braund & Associates, 1997.

Table 5: Comparison of Ten Alaska Eskimo Whaling Communities' mid-1980s Subsistence and Cultural Need for Landed Bowhead Whales with 1990, 1992, and 1997 Need.\1

Community	Mean Landed Per Capita 1910-1969\2	Mid-1980s Calculation Data: Est. 1983-87 AK Na. Pop.\3	Date of Pop. Est\3	1987 Bowhead Need (Lnded)\4	1987 Need (Landed) (Rnded)\5	1990 Calculation Data: 1990 AK Native Pop.\6	1990 Bowhead Need (Lnded)\7	1990 Need (Landed) (Rnded)\5	1992 Calculation Data: Est. 1992 AK Native Pop.\8	1992 Bowhead Need (Lnded)\9	1992 Need (Landed) (Rnded)\6	1997 Calculation Data: Est. 1997 AK Native Pop.\10	1997 Bowhead Need (Lnded)\11	1997 Need (Landed) (Rnded)\6
Gambell	0.005722	495	1987	2.8	3	505	2.9	3	530	3.0	3	628	3.6	4
Savoonga	0.005722	485	1985	2.8	3	494	2.8	3	515	2.9	3	592	3.4	3
Wales	0.000724	154	1987	0.1	1	143	0.1	1	129	0.1	1	144	0.1	1
Diomede Is	0.003676	N/A	N/A	N/A	N/A	167	0.6	1	169	0.6	1	163	0.6	1
Kivalina	0.003240	275	1987	0.9	1	309	1.0	1	356	1.2	1	348	1.1	1
Point Hope	0.016764	534	1986	9.0	9	587	9.8	10	629	10.5	11	688	11.5	12
Wainwright	0.010072	445	1983	4.5	5	464	4.7	5	505	5.1	5	519	5.2	5
Barrow	0.008481	1,823	1986	15.5	16	2,217	18.8	19	2,532	21.47	21	2,799	23.7	24
Nuiqsut	0.008481	227	1983	1.9	2	328	2.8	3	364	3.1	3	403	3.4	3
Kaktovik	0.009174	154	1983	1.4	1	189	1.7	2	183	1.7	2	187	1.7	2
Totals		4,592		38.8	41	5,403	45.3	48	5,912	49.7	51	6,472	54.4	56
Region w/o Dio	0.008815	4,592		40.5	41									
Region w/ Dio	0.008621					5,403	46.6	48	5,912	51.0	51	6,472	55.8	56

\1 Subsistence and cultural need is based on historic per capita harvest per community multiplied by the Alaska Native population of each community.
\2 See Table 1, footnote \5 for explanation of mean landed bowheads per capita.
\3 See Braund, Stoker & Kruse (1988) Table 7 for source of mid-1980s Alaska Native population data.
\4 The number of bowheads needed in 1987 was derived by multiplying the mean per capita landed whales (1910-1969) by the most current Alaska Native population data available for each community in 1988.
\5 The number of bowheads 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.
\6 1990 Alaska Native population data for each community are from the 1990 U.S. Census.
\7 The number of bowheads needed in 1990 is derived by multiplying the mean per capita landed whales (1910-1969) by the 1990 Alaska Native population for each community.
\8 1992 Alaska Native population data for each community are from the Alaska Department of Labor, Research & Analysis Section, Demographics Unit. J. Gregory Williams, State Demographer, 3/15/94.
\9 The number of bowheads needed in 1992 is derived by multiplying the mean per capita landed whales (1910-1969) by the estimated 1992 Alaska Native population for each community.
\10 1997 Alaska Native population data for each community are from the Alaska Department of Labor, Research & Analysis Section (1997a) 7/1/97 population estimates multiplied by the percent Native American in each community from the 1990 U.S. Census.
\11 The number of bowheads needed in 1997 is derived by multiplying the mean per capita landed whales (1910-1969) by the estimated 1997 Alaska Native population for each community.

Stephen R. Braund & Associates, 1997.

update the calculation of subsistence and cultural need for bowhead whales). Between the mid-1980s and 1990, the Alaska Native population in these communities grew at an annual rate of a low of -2.4 percent in Wales to a high of 6.4 percent in Nuiqsut. Because the beginning population data year varied (e.g., from 1983 to 1987), it is not possible to calculate the percent change for all of the communities combined. From 1990 to 1992, the Alaska Native population in these 10 communities grew at an annual rate of a low of -4.9 percent in Wales to 7.1 percent and 7.6 percent in Barrow and Kivalina respectively. The average annual growth rate for all ten communities was 4.7 percent during this two year period. Between the mid-1980s and 1997, the annual rate of increase in the communities ranged from -.7 percent in Wales to 4.9 percent and 5.5 percent in Barrow and Nuiqsut respectively. Between 1992 and 1997, the annual growth rate ranged from a low of -.7 percent in Diomede to a high of 3.7 percent in Gambell. The annual rate of growth for the ten communities combined during the past five years is 1.9 percent per year. This compares with an annual growth rate for the State of Alaska from 6/30/90 to 6/30/96 of 1.65 percent (Alaska Department of Labor 1997c). In addition, the 1.9 percent annual rate of growth between 1992 and 1997 for these 10 communities is substantially lower than the 4.7 percent annual rate of growth between 1990 and 1992.

In an effort to understand the growth rates in these communities, the study team collected data on the births and deaths in the communities from 1991 to 1996, the latest year for which these data are available (Table 7). These data indicate that approximately 77 percent of the regional growth from 1990 to 1996 was due to natural increase (births less deaths) and approximately 23 percent was due to migration. The annual birth rate per 1,000 persons was 26.7 while the annual death rate per 1,000 persons was 5.7. This compares with an average annual birth per 1,000 persons of 18.8 and average annual deaths per 1,000 persons of 4.0 for the State of Alaska from 1990 to 1996 (ibid.).

Table 6: Comparison of Ten Alaska Eskimo Whaling Communities' Native Population: mid-1980s, 1990, 1992, and 1997.

		1983-87 to 1990				1990 to 1992		1992 to 1997		1983-87 to 1997	
Community	Date of 1983-87 Pop. Est\1	Est. 1983-87 AK Na Pop.\1	Yrs fr 1983-87 to 1990\2	1990 AK Na Pop.\3	% Change Per Yr fr 1983-87 to 1990\4	Est. 1992 AK Na Pop.\5	% Change Per Year 1990 to to 1992\6,7	Est. 1997 AK Na Pop.\8	% Change Per Year 1992 to to 1997\7,9	Yrs fr 1983-87 to 1997\10	% Change Per Year 1983-87 to 1997\11
Gambell	1987	495	3	505	0.7%	530	2.5%	628	3.7%	10	2.7%
Savoonga	1985	485	5	494	0.4%	515	2.1%	592	3.0%	12	1.8%
Wales	1987	154	3	143	-2.4%	129	-4.9%	144	2.3%	10	-0.7%
Diomede Is	N/A	N/A	N/A	167	N/A	169	0.6%	163	-0.7%	N/A	N/A
Kivalina	1987	275	3	309	4.1%	356	7.6%	348	-0.4%	10	2.7%
Point Hope	1986	534	4	587	2.5%	629	3.6%	688	1.9%	11	2.6%
Wainwright	1983	445	7	464	0.6%	505	4.4%	519	0.5%	14	1.2%
Barrow	1986	1,823	4	2,217	5.4%	2,532	7.1%	2,799	2.1%	11	4.9%
Nuiqsut	1983	227	7	328	6.4%	364	5.5%	403	2.1%	14	5.5%
Kaktovik	1983	154	7	189	3.2%	183	-1.6%	187	0.5%	14	1.5%
Totals		4,592		5,403		5,912		6,472			
Region							4.7%		1.9%		

\1 See Braund, Stoker & Kruse (1988) Table 7 for source of mid-1980s Alaska Native population data.
\2 Number of years between the 1990 U.S. Census and the 1983-87 population figures for each community.
\3 1990 Alaska Native population data for each community are from the 1990 U.S. Census.
\4 1990 Alaska Native population minus 1983-87 population divided by 1987-83 population divided by the number of years from 1983-87 to 1990.
\5 1992 Alaska Native population data for each community are from the Alaska Department of Labor, Research & Analysis Section, Demographics Unit. J. Gregory Williams, State Demographer, 3/15/94.
\6 1992 Alaska Native population minus 1990 population divided by 1990 population divided by two years (the number of years from 1990 to 1992).
\7 The percent change per year for all communities (i.e., Region) does not represent a sum of community percents, but rather the percent change per year for the total population of all ten communities (i.e., region) between the designated years.
\8 1997 Alaska Native population data for each community are from the Alaska Department of Labor, Research & Analysis Section (1997a) 7/1/97 population estimates multiplied by the percent Native American in each community from the 1990 U.S. Census.
\9 1997 Alaska Native population minus 1992 population divided by 1992 population divided by five years (the number of years from 1992 to 1997).
\10 Number of years between the 1997 estimated Alaska Native population figures for each community and the 1983-87 population estimates.
\11 1997 Alaska Native population minus 1983-87 population divided by 1983-87 population divided by the number of years from 1983 to 1997.

Stephen R. Braund & Associates, 1997.

IWC-97.XLS - T6-Compare Pop 10/13/97

Table 7: Residential Births and Deaths in Ten Alaska Eskimo Whaling Communities, 1991-96.\1

	Native American Population			Births		Deaths					
Community\2	4/1/90	7/1/96	Pop. Change 1990-96\3	Births\4 1991-96\5	Annual Rate/1000 Mid Period Population\6	Deaths\4 1991-96\5	Annual Rate/1000 Mid Period Population\7	Natural Increase (Births-Deaths) 1991-96\5	Net Migrants	% of Pop. Change Due to Natural Increase\8,9	% of Pop. Change Due to Migration\9
Gambell	505	612	107	102	30.2	17	5.0	85	22	79%	21%
Savoonga	494	583	89	102	31.2	19	5.8	83	6	93%	7%
Wales	143	147	4	20	24.1	9	10.8	11	-7	N/A	N/A
Diomede Is	167	160	-7	4	4.0	4	4.0	0	-7	0%	100%
Kivalina	309	344	35	62	29.0	6	2.8	56	-21	N/A	N/A
Point Hope	587	694	107	97	26.0	21	5.6	76	31	71%	29%
Wainwright	464	528	64	71	23.4	19	6.3	52	12	81%	19%
Barrow	2,217	2,721	504	414	27.7	91	6.1	323	181	64%	36%
Nuiqsut	328	396	68	55	24.5	13	5.8	42	26	62%	38%
Kaktovik	189	186	-3	24	22.5	4	3.7	20	-23	N/A	N/A
Totals	5,403	6,371	968	951		203		748	220		
Region\10					26.7		5.7			77%	23%

\1 Population, birth and death data are for Alaska Natives only.
\2 Refers to community of mother's residence and community of decedent's residence.
\3 1996 Alaska Native population in each community minus 1990 population.
\4 Birth and death data from the Alaska Department of Health and Social Services, Bureau of Vital Statistics (1997).
\5 1996 data are provisional and subject to change.
\6 Annual Rate/1000 is calculated by dividing the total births from 1991-96 by 6 years for an average annual number of births. This number is then divided by the 7/1/93 population (the mid period population from 4/1/90 to 7/1/96) multiplied by 1,000 to determine the rate/1000 people.
\7 Annual Rate/1000 is calculated by dividing the total deaths from 1991-96 by 6 years for an average annual number of deaths. This number is then divided by the 7/1/93 population (the mid period population from 4/1/90 to 7/1/96) multiplied by 1,000 to determine the rate/1000 people.
\8 Net natural increase (e.g., births minus deaths) in each community divided by total population change between 1990 and 1996.
\9 The percent of the population change due to natural increase and migration is not applicable when the population change is less than natural increase.

Stephen R. Braund & Associates, 1997.

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Appendix A: DOCUMENTS SUBMITTED BY THE U.S. TO THE IWC RE: ALASKA ESKIMO BOWHEAD WHALING

1979

International Whaling Commission

1979 Report of the Panel to Consider Cultural Aspects of Aboriginal Whaling in North Alaska. Meeting in Seattle, WA. February 5-9, 1979 under the auspices of the International Whaling Commission.

1980

U.S. Department of the Interior

1980 Interim Report on Aboriginal/Subsistence Whaling of the Bowhead Whale by Alaskan Eskimos.

1983

Alaska Consultants, Inc. and Stephen Braund & Associates

1984 Subsistence Study of Alaska Eskimo Whaling Villages. Prepared for the Bureau of Indian Affairs, U.S. Department of the Interior.

IWC/TC/35/AB3

U.S. Government

1983 Report on Nutritional, Subsistence, and Cultural Needs Relating to the Catch of Bowhead Whales by Alaskan Natives. Submitted by the U.S. Government to the International Whaling Commission at its 35th Annual Meeting. International Whaling Commission TC/35/AB3.

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IWC/TC/40/AS2

Braund, S.R., W.M. Marquette and J.R. Bockstoce

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Braund, S.R., S.W. Stoker, and J.A. Kruse

1988 Quantification of Subsistence and Cultural Need for Bowhead Whales by Alaska Eskimos. Stephen R. Braund & Associates, Anchorage, Alaska. Prepared for the Bureau of Indian Affairs, Department of the Interior. International Whaling Commission TC/40/AS2.

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1994 Quantification of Subsistence and Cultural Need for Bowhead Whales by Alaska Eskimos - 1994 Update Based on 1992 Alaska Department of Labor Data. International Whaling Commission report IWC/46/AS 6. Prepared for the Alaska Eskimo Whaling Commission. Barrow, Alaska.

1997
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1997 Quantification of Subsistence and Cultural Need for Bowhead Whales by Alaska Eskimos - 1997 Update Based on 1997 Alaska Department of Labor Data. International Whaling Commission report IWC/46/AS. Prepared for the Alaska Eskimo Whaling Commission. Barrow, Alaska.

8.2 National Oceanic and Atmospheric Administration-Alaska Eskimo Whaling Commission Cooperative Agreement (2008, with 2011 Amendment)

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COOPERATIVE AGREEMENT
between the
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
and the
ALASKA ESKIMO WHALING COMMISSION
as amended
2008

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 2012; 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 2012. 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 2008. The AEWC and NOAA shall determine the total number of bowhead whales that may be struck in each year from 2009 through 2012, 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

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 is in effect from March, 1981 through March 31, 2008.

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.

Received Time Jan. 8. 9:00AM

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 Commissioner to the International Whaling Commission, or his designee.

Dated: April 3, 2008

Dated: APR 01 2008

Harry Brower Jr.
Harry K. Brower, Jr.
Chairman, Alaska Eskimo
Whaling Commission

James W. Balsiger
Acting Assistant Administrator for Fisheries

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 2011. The AEWC and NOAA shall determine the total number of bowhead whales that may be struck in 2012, and any applicable number of bowhead whales that may be landed, through annual negotiations prior to the year for which the quota is applicable. Provided, however, that the Under Secretary may, in consultation with the AEWC, reconsider and revise the terms of this paragraph if she deems it necessary pursuant to the Federal Register notice of the allocations."

Harry Brower Jr

Harry K. Brower, Jr.
Chairman, Alaska Eskimo Whaling Commission

Date: 17 Feb. 2011

Monica Medina

Monica Medina
U.S. Commissioner to the International Whaling Commission

Date: 23 Feb, 2011

8.3 Federal Register Notice on Whaling Provisions; Aboriginal Subsistence Whaling Quota (April 10, 2012)

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development and implementation of regulations governing the incidental taking of marine mammals by USFWS will be considered by NMFS in developing, if appropriate, regulations governing the issuance of letters of authorization.

Dated: April 4, 2012.

Helen M. Golde,

Acting Director, Office of Protected Resources, National Marine Fisheries Service.

[FR Doc. 2012–8602 Filed 4–9–12; 8:45 am]

BILLING CODE 3510–22–P

DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

RIN 0648–XA967

Whaling Provisions; Aboriginal Subsistence Whaling Quotas

AGENCY: National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration (NOAA), Commerce.

ACTION: Notice; notification of quota for bowhead whales.

SUMMARY: NMFS notifies the public of the aboriginal subsistence whaling quota for bowhead whales that it has assigned to the Alaska Eskimo Whaling Commission (AEWC), and of limitations on the use of the quota deriving from regulations adopted at the 59th Annual Meeting of the International Whaling Commission (IWC). For 2012, the quota is 75 bowhead whales struck. This quota and other applicable limitations govern the harvest of bowhead whales by members of the AEWC.

DATES: Effective April 10, 2012.

ADDRESSES: Office of International Affairs, National Marine Fisheries Service, 1315 East-West Highway, Silver Spring, MD 20910.

FOR FURTHER INFORMATION CONTACT: Melissa Andersen, (301) 427–8385.

SUPPLEMENTARY INFORMATION: Aboriginal subsistence whaling in the United States is governed by the Whaling Convention Act (16 U.S.C. 916 *et seq.*). Regulations that implement the Act, found at 50 CFR 230.6, require the Secretary of Commerce (Secretary) to publish, at least annually, aboriginal subsistence whaling quotas and any other limitations on aboriginal subsistence whaling deriving from regulations of the IWC.

At the 59th Annual Meeting of the IWC, the Commission set catch limits for aboriginal subsistence use of bowhead whales from the Bering-Chukchi-Beaufort Seas stock. The bowhead catch limits were based on a joint request by the United States and the Russian Federation, accompanied by documentation concerning the needs of two Native groups: Alaska Eskimos and Chukotka Natives in the Russian Far East.

The IWC set a 5-year block quota of 280 bowhead whales landed. For each of the years 2008 through 2012, the number of bowhead whales struck may not exceed 67, except that any unused portion of a strike quota from any prior year, including 15 unused strikes from the 2003 through 2007 quota, may be carried forward. No more than 15 strikes may be added to the strike quota for any one year. At the end of the 2011 harvest, there were 15 unused strikes available for carry-forward, so the combined strike quota set by the IWC for 2012 is 82 (67 + 15).

An arrangement between the United States and the Russian Federation ensures that the total quota of bowhead whales landed and struck in 2012 will not exceed the limits set by the IWC. Under this arrangement, the Russian natives may use no more than seven strikes, and the Alaska Eskimos may use no more than 75 strikes.

Through its cooperative agreement with the AEWC, NOAA has assigned 75 strikes to the Alaska Eskimos. The AEWC will in turn allocate these strikes among the 11 villages whose cultural and subsistence needs have been documented, and will ensure that its hunters use no more than 75 strikes.

Other Limitations

The IWC regulations, as well as the NOAA regulation at 50 CFR 230.4(c), forbid the taking of calves or any whale accompanied by a calf.

NOAA regulations (at 50 CFR 230.4) contain a number of other prohibitions relating to aboriginal subsistence whaling, some of which are summarized here:

- Only licensed whaling captains or crew under the control of those captains may engage in whaling.
- Captains and crew must follow the provisions of the relevant cooperative agreement between NOAA and a Native American whaling organization.
- The aboriginal hunters must have adequate crew, supplies, and equipment to engage in an efficient operation.
- Crew may not receive money for participating in the hunt.
- No person may sell or offer for sale whale products from whales taken in the hunt, except for authentic articles of Native American handicrafts.
- Captains may not continue to whale after the relevant quota is taken, after the season has been closed, or if their licenses have been suspended. They may not engage in whaling in a wasteful manner.

Dated: April 5, 2012.

Rebecca J. Lent,

Director, Office of International Affairs, National Marine Fisheries Service.

[FR Doc. 2012–8611 Filed 4–9–12; 8:45 am]

BILLING CODE 3510–22–P

DEPARTMENT OF EDUCATION

Notice of Submission for OMB Review; Federal Student Aid; Comprehensive Transition Programs (CTP) for Students With Intellectual Disabilities Expenditure Report

SUMMARY: The Higher Education Opportunity Act, Public Law 110–315, added provisions for the Higher Education Act, as amended in section 750 and 766 that enable eligible students with intellectual disabilities to receive Federal Pell Grant, Supplemental Educational Opportunity Grant, and Federal Work Study funds if they are enrolled in an approved program. The CTP Expenditure Report is the tool for reporting the use of these specific funds.

DATES: Interested persons are invited to submit comments on or before May 10, 2012.

ADDRESSES: Written comments regarding burden and/or the collection activity requirements should be electronically mailed to *ICDocketMgr@ed.gov* or mailed to U.S. Department of Education, 400 Maryland Avenue SW., LBJ, Washington, DC 20202–4537. Copies of the proposed information collection request may be accessed from *http://edicsweb.ed.gov,* by selecting the ''Browse Pending Collections'' link and by clicking on link number 04770. When you access the information collection, click on ''Download Attachments'' to view. Written requests for information should be addressed to U.S. Department of Education, 400 Maryland Avenue SW., LBJ, Washington, DC 20202–4537. Requests may also be electronically mailed to *ICDocketMgr@ed.gov* or faxed to 202–401–0920. Please specify the complete title of the information collection and OMB Control Number when making your request.

Individuals who use a telecommunications device for the deaf (TDD) may call the Federal Information Relay Service (FIRS) at 1–800–877–8339.

SUPPLEMENTARY INFORMATION: Section 3506 of the Paperwork Reduction Act of 1995 (44 U.S.C. Chapter 35) requires

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8.4 Alaska Eskimo Whaling Commission Management Plan

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ALASKA ESKIMO WHALING COMMISSION

MANAGEMENT PLAN

AS AMENDED ON

FEBRUARY 15, 1991

FEBRUARY 14, 1992

FEBRUARY 15, 1995

ALASKA ESKIMO WHALING COMMISSION

MANAGEMENT PLAN

SUBPART A

INTRODUCTION

SUBSECTION 100.1 PURPOSE OF REGULATIONS.

It is the purposes of the regulations contained herein to:

(a) insure an efficient subsistence harvest of bowhead whales;

(b) provide a means within the Alaska Eskimo customs and institution 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 SCOPE OF REGULATIONS.

The regulation contained herein apply to the subsistence hunting of whales by Eskimos who are members of the Alaska Eskimo Whaling Commission.

SUBPART B

ALASKA ESKIMO WHALING COMMISSION

SUBSECTION 100.11 POWERS.

(a) The Alaska Eskimo Whaling Commission (hereinafter 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 person who violates these regulations the right to participate in hunting bowhead whales.

(2) making civil assessments.

(3) acting as an enforcement agent for any governmental entity authorized to enforce these 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 migrates past whaling villages in Alaska.

(b) "captain" means the person in charge of a 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, shoulder 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 Figures 7 and 8 of Appendix E of the FEIS on the International Whaling Commission's Deletion of Native Exemption 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 has an explosive charge and which has no attached line and float. (See Appendix E of the FEIS in Figure 5).

(4) "lance" means a non-explosive sharply pointed weapon without a harpoon head.

(5) "explosive charge" as used in subparagraph (2) of this paragraph means for initial strikes a penthrite-based explosive charge developed, approved, and issued to a whaling cpatain by the AEWC, unless such explosive charge has not been issued or is not compatible with the darting gun harpoon in which case every effort shall be made by the AEWC to provide a compatible darting gun harpoon.

(f) "whaling crew" means those persons who participate directly in the harvest or attempted harvest of the bowhead whale and are under the supervision of a 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 waters and associated land and ice environment used by the bowhead whale.

SUBSECTION 100.22 <u>REGISTRATION.</u>

(a) Each captain shall register with the AEWC on forms provided by the AEWC for that purpose which disclosed his name, address, age, 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.

(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 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 PERMISSABLE 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 may 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 attached to it.

(4) the lance may be used after a line has been secured to the bowhead whale.

(c) Whaling captains and crews should harvest bowhead whales that are less than 40 feet plus (+) or minus (-) 15% in length.

Subsection 100.25 **TRADITIONAL PROPIETARY 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 attempt 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 **REGULATION TO PROTECT THE BOWHEAD WHALE HABITAT.**

(a) All whaling crew 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 handicrafts, of whales taken in the subsistence hunt must be exclusively for native consumption and may not be sold or offered for sale.

SUBSECTION 100.31 **DENIAL OF PARTICIPATION IN HARVEST AND FINES.**

(a) Any person who the AEWC determines has violated the regulations contained in subsection 100.24 (a) and (b) and subsection 100.26 shall, after opportunity for a hearing before the AEWC, be prohibited from harvesting or attempting to harvest the bowhead whale for a period of not less than one whaling season nor more than five whaling season; and / or

(b) Any person who violates the regulations contained in subsection 100.24 (a) and (b) and subsection 100.26 herein shall be subject to a fine of not less than $1,00.00 nor more than $10,000.00 as assessed by AEWC. The AEWC shall assess other fines at levels it deems appropriate, not to exceed $10,000.00, for other violations of this Management Plan or federal law. No person shall harvest or attempt to harvest the bowhead whale until such fine has been paid.

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 Commissioner 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
REPORTS 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.)

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8.5 U.S Fish and Wildlife Endangered Species Consultation Letter (May 15, 2012)

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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 15, 2012

Mr. Brad Smith
Field Office Supervisor
Protected Resources Division
NMFS Alaska Region
222 W. 7th Ave., #43
Anchorage, AK 99513-7577

Mr. Smith:

This letter responds to your inquiry regarding endangered and threatened species and critical habitats pursuant to section 7 of the Endangered Species Act of 1973, as amended (Act). We understand you propose to issue annual quotas to the Alaska Eskimo Whaling Commission for a subsistence hunt on bowhead whales for the years 2013 - 2018 with an annual strike quota of 67 bowhead whales, with carry-over of up to 15 unused strikes from a previous year, not to exceed a total of 306 landed whales over the six years.

The bowhead whale harvest occurs within the distribution of three species listed as threatened under the Act: Alaska-breeding Steller's cider (*Polysticta stelleri*), spectacled eider (*Somateria fischeri*), and polar bear (*Ursus maritimus*); and three candidate species: yellow-billed loon (*Gavia adamsii*), Kittlitz's murrelet (*Brachyramphus brevirostri)* and Pacific walrus *(Odobenus rosmarus divergens)*. Based on the National Marine Fisheries Service's (NMFS) map of bowhead subsistence use areas, harvest may occur within designated polar bear critical habitat and spectacled eider critical habitat.

Listed and candidate avian species
The bowhead whale hunt occurs as spectacled and Steller's eiders and yellow-billed loons 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 or yellow-billed loons, but any disturbance by boats or hunting camps will be temporary, as individual birds are unlikely to spend long 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).

A portion of the Kittlitz's murrelet population likely follows the retreating ice edge in the Chukchi Sea in late summer and fall, but it is unlikely that the birds would be encountered in significant numbers during subsistence whaling activities, particularly as the ice edge retreats farther from whaling subsistence use areas. If murrelets are encountered, any disturbance that does occur is likely to be brief for the same reasons listed above for eiders and loons.

In summary, we expect that subsistence whaling activities under the proposed quota would have, at most, an insignificant 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.

Listed and candidate marine mammals
It is possible that polar bears will 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 the 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.

Walrus typically follow the ice edge as it retreats in the spring and summer, and they are unlikely to be encountered, particularly in large numbers, during spring whaling activities. In recent years, walrus have begun to haul out in high numbers along the Chukchi Sea coast in the fall. Disturbance of large haul-outs can result in stampedes and the trampling and death of young and even adult walrus. It is possible that fall whaling activities may occur when walrus occupy terrestrial haul-outs; however, we believe that the extensive outreach and education in coastal villages on proper avoidance measures minimizes the probability that haul-outs will be disturbed during whaling activities. Therefore, because disturbance to walrus is unlikely to occur, we consider the potential effects of the subsistence whale hunt on walrus discountable.

Polar bear designated critical habitat
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.

Given the reasons above, we conclude that NMFS's proposed issuance of the bowhead whale quota is unlikely to adversely affect listed species under the Service's jurisdiction. Preparation of a Biological Assessment or further consultation under Section 7 of the Act is not necessary. If you need further assistance, please contact me at (907) 456-0297.

Sincerely,

Neesha Stellrecht
Acting Endangered Species Branch Chief

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8.6 Mailing List

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U.S. Congress Members		
Senator Lisa Murkowski	Senator Mark Begich	Representative Don Young
Government Agencies		
Mike Letourneau U.S. Environmental Protection Agency, Region 10	Jennifer Curtis U.S. Environmental Protection Agency, Region 10	Lori Quakenbush Alaska Department of Fish & Game, Habitat Division
Tim Jennings U.S Fish and Wildlife Service	Neesha Stellrecht U.S. Fish and Wildlife Service	Dr. Timothy Ragan Executive Director Marine Mammal Commission
Dr. Doug DeMaster AFSC, NOAA Fisheries	Dr. Robyn Angliss National Marine Mammal Laboratory, AFSC, NOAA Fisheries	Dr. James Balsiger NOAA Fisheries
Dr. Shannon Bettridge NOAA Fisheries Office of Protected Resources	Melissa Andersen IWC Coordinator NOAA Fisheries	Jay Nunenkamp NOAA/Office of Program Planning and Integration
Kim Shelden National Marine Mammal Laboratory, AFSC, NOAA Fisheries	Roger B. Eckert NOAA/GCF	Steve Davis NOAA Fisheries
Brad Smith NOAA Fisheries, Office of Protected Resources	John Kurland NOAA Fisheries	Jim Hale NOAA Fisheries
North Slope Borough Departments		
Mayor Charlotte Brower	Taqulik Hepa Department of Wildlife Management	Sue Bowen Department of Law
Tribal and Native Organizations		
Charles Okakok, President Inupiat Community of Arctic Slope	Emily Frantz Inupiat Community for the Arctic Slope	Isaac Akootchook, President Kaktovik Village
Thomas Olemaun Native Village of Barrow	Fritz Waghiyi, President Native Village of Savoonga	
Other Native Groups		
Jessica Lefevre, Counsel Alaska Eskimo Whaling Commission	Earl Comstock, Counsel Alaska Eskimo Whaling Commission	Willie Goodwin Alaska Beluga Whale Committee
Robert Suydam For the Alaska Beluga Whale Committee		
Non-Governmental Organizations		
D.J. Schubert Animal Welfare Institute	Sue Rocca Whale and Dolphin Conservation Society	Will Anderson Green Vegans/New Human Ecology
Public		
Jeffrey W. Leppo Stoel Rivers, LLP	Robert Shears Wainwright, Alaska	Theresa Winter Kasilof, Alaska

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