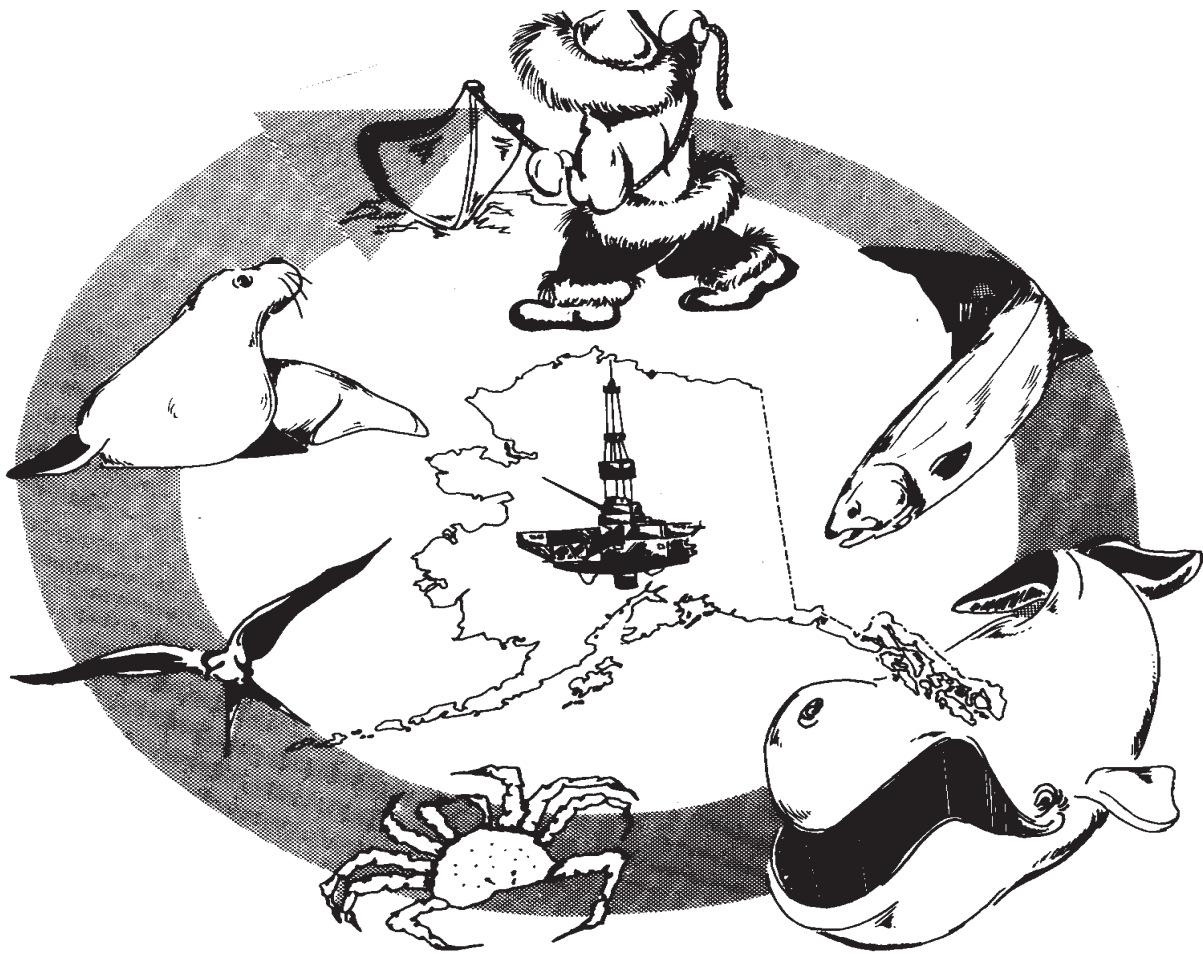


Alaska Outer Continental
Shelf Region

Alaska Annual Studies Plan
Final FY 2004



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ACRONYMS, INITIALISMS, ABBREVIATIONS, AND SYMBOLS

ABL	Auke Bay Laboratory
ADCP	acoustic Doppler current profiler
ADF&G	Alaska Department of Fish and Game
AEPS	Arctic Environmental Protection Strategy
AEWC	Alaska Eskimo Whaling Commission
AFTC	Alaska Frozen-Tissue Collection
AK	Alaska
AMAP	Arctic Monitoring and Assessment Program
AMMTAP	Alaska Marine Mammal Tissue Archival Project
ANCSA	Alaska Native Claims Settlement Act
ANIMIDA	Arctic Nearshore Impact Monitoring in Development Area
ANWR	Arctic National Wildlife Refuge
ASP	Annual Studies Plan (Alaska OCS Region)
Bbl	barrel
BIA	Bureau of Indian Affairs
BLM	Bureau of Land Management
BRD	Biological Resources Division (USGS)
C	Celsius
CAFF	Conservation of Arctic Flora and Fauna [working group]
CD-ROM	Compact Disk Read Only Memory
C.F.R.	Code of Federal Regulations
CI	Confidence Interval
CIRCAC	Cook Inlet Regional Citizens' Advisory Council
cm	centimeter
CMI	Coastal Marine Institute
CORIS	Coastal Offshore Resource Information System
COZOIL	Coastal and Surf Zone Oil-Spill-Transport Model
CP	Comprehensive Program
CTD	conductivity-temperature-depth [measuring device]
DEW	Defense Early Warning
DOI	Department of Interior
DPP	Development and Production Plan
EA	Environmental Assessment
EAS	Environmental Assessment Section
ECMRWF	European Center for Medium Range Weather Forecasting
Ed.	Editor
Eds.	Editors
e.g.	for example
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
ESA	Endangered Species Act
ESP	Environmental Studies Program
EVOS	<i>Exxon Valdez</i> Oil Spill
FEAM	Fisheries Economic Assessment Model
Fig.	Figure
FJMC	Fisheries Joint Management Committee
FLIR	Forward Looking Infra-Red (FLIR) Imagery

FNOC	Fleet Numerical Oceanography Center
FY	Fiscal Year
GIS	Geographical Information Systems
GPS	Global Positioning System
GSA	General Services Administration
GUI	Graphical User Interface
Hg	Mercury
IA	Interagency Agreement
IBR	Information Base Review
i.e.	that is
IMPLAN	Impact Analysis for Planning
IR	infrared
ITM	Information Transfer Meeting
IUM	Information Update Meeting
kHz	kiloHertz
km	kilometer
m	meter
ml	milliliter
MMPA	Marine Mammal Protection Act
MMS	Minerals Management Service
NAB	Northwest Arctic Borough
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NODC	National Oceanographic Data Center
NORM	normally occurring radioactive materials
NPDES	National Pollutant Discharge Elimination System
NPR-A	National Petroleum Reserve-Alaska
NRC	National Research Council
NSB	North Slope Borough
NSF	National Science Foundation
NSP	National Strategic Plan (MMS)
NTIS	National Technical Information Service
OCS	Outer Continental Shelf
OCSEAP	Outer Continental Shelf Environmental Assessment Program
OCSLA	Outer Continental Shelf Lands Act
OCSLAA	Outer Continental Shelf Lands Act as Amended
ODPCP	Oil Discharge Prevention and Contingency Plan
ODPCP	Oil Discharge Prevention and Contingency Plan
OMPA	Office of Marine Pollution Assessment
OSRA	Oil-Spill-Risk Analysis
OWM	Oil-Weathering Model
PAH	polycyclic aromatic hydrocarbons
PC	personal computer
PDF	portable document file
ppm	parts per million

RFIC	Request for Information and Comments
SDE	Spatial database engine
SINTEF	Foundation for Scientific and Industrial Resources of the Norwegian Institute of Technology [Norwegian acronym]
SAR	synthetic aperture radar
SINTEF	[Norwegian acronym in English meaning] The Foundation for Scientific and Industrial Resources of the Norwegian Institute of Technology
SNOMED	Systematized Nomenclature of Medicine
SPED	Sub-sea Physical Environmental Database
SPEM	Semi-Spectral Primitive Equation Model
SRB	Scientific Review Board
TAG	Technical Assessment Group
TAR	Technology Assessment and Research (TAR) Program
TBD	To Be Determined
TDR	Time-depth recorder
TIMS	Technical Information Management System
TR	Technical Report
UAA	University of Alaska Anchorage
UAF	University of Alaska Fairbanks
U.S.	United States
USDOC	U.S. Department of Commerce
USDOD	U.S. Department of Defense
USDOI	U.S. Department of the Interior
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
U.S.S.R.	Union of Soviet Socialist Republics
VHF	very high frequency
WOSM	World Oil-Spill Model
Symbols	
>	greater than
<	less than

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SECTION 1. Programmatic Overview

Section 1.1 Introduction to the Region

Background

The Alaska Environmental Studies Program (ESP) was initiated by the U.S. Department of the Interior (USDOI) in 1974 in response to the Federal Government's decision to propose areas of Alaska for offshore gas and oil development. Federal management of the Outer Continental Shelf (OCS) is guided by several legislative acts. Regulations implementing the OCS Lands Act (OCSLA) of 1953, as amended in 1978 (OCSLAA), designated the Bureau of Land Management (BLM) as the administrative agency responsible for leasing and the U.S. Geological Survey (USGS) as responsible for supervising classification, evaluation, development, and production of mineral resources on submerged Federal lands. The offices under BLM and USGS responsible for offshore leasing were reorganized as the Minerals Management Service (MMS) in 1982. One of the goals of the OCSLA was to provide for protection of the environment concomitant with mineral-resource development. The OCSLA requires the Secretary of the Interior to conduct environmental studies to obtain information pertinent to sound leasing decisions as well as to monitor the human, marine, and coastal environments (OCSLAA, 1978 [Public Law 95-372, Section 20]). Also, the National Environmental Policy Act (NEPA) of 1969 requires that all Federal Agencies use a systematic, interdisciplinary approach that will ensure the integrated use of the natural and social sciences in any planning and decision making that may have effects on the environment. Federal laws impose additional requirements on the offshore leasing process, including the Coastal Zone Management Act; Federal Water Pollution Control Act Amendments; Marine Mammal Protection Act (MMPA); Endangered Species Act (ESA); and Marine Protection, Research, and Sanctuaries Act.

The purpose of the ESP is to define information needs and implement studies to assist in predicting, projecting, assessing, and managing potential effects on the human, marine, and coastal environments of the OCS and coastal areas that may be affected by gas and oil development. Lease-management decisions are enhanced when current, pertinent, and timely information is available. To attain program goals, data on specific environmental, social, and economic concerns arising from offshore leasing are required. The ESP then monitors any effects during and after oil exploration and development. It is the largest, single-agency, mission-oriented, marine-studies program in the Federal Government. Since the ESP inception through Fiscal Year (FY) 2002, more than \$733 million have been spent on the ESP nationally. More than \$275 million of this amount has funded Alaskan studies in 15 planning areas in the Arctic, Bering Sea, and Gulf of Alaska Subregions (see Fig. 1).

Early in the development of the program, the focus was on obtaining baseline information on the vast biological resources and physical characteristics of the Alaskan environment for prelease decision making. These studies included biological surveys of marine species, basic oceanography and meteorology, and geologic and sea-ice phenomena. As a broader base of information was established, it became possible to focus on more topical studies in smaller areas

Fig. 1 Alaska Planning Areas

— Planning area boundary



Note:
The maritime boundaries and limits shown, as well as the divisions between the planning areas, are for initial planning purposes only and do not prejudice or affect United States jurisdiction in any way.

to answer specific questions and fill identified information needs. In addition, a number of generic studies were initiated on the potential effects of oil contamination on biological resources and on the probable transport and dispersion of oil that might be spilled in the marine environment.

The use of computer-modeling techniques has been implemented to aid in the assessment of potential oil-spill and other pollutant risks to the environment and to key species such as fur seals, sea otters, and endangered whales. Modeling also has been used in the ecosystem studies, especially where extrapolation to other areas seemed warranted.

As more disciplinary data were collected and analyzed, the importance of taking an integrated, interdisciplinary look at complete ecosystems in sensitive areas became apparent. During this time, the leasing program was maturing. As a number of sales were held and exploration activities began, postlease studies to monitor the possible effects of gas and oil activities on the environment and resources of these areas were initiated. The ESP provides information for development of the 5-year leasing schedule and for prelease- and lease-related decisions, and develops monitoring information necessary for postlease management.

As studies information has been amassed, improved focus has required greater integration of various scientific disciplines. The MMS has initiated Synthesis Meetings, Information Transfer Meetings (ITM's), and Information Update Meetings (IUM's) to gather maximum expertise and assess the status of existing information, and to plan the best possible approach to a study within the constraints of time and resources. As the MMS and other Federal and State agencies collect more pertinent information, the MMS funds studies to search and evaluate existing literature and data prior to initiation of field efforts. This prevents duplication of effort and saves valuable resources by focusing later study efforts on the areas of greatest information need and highest usefulness to MMS decision needs.

As noted by the National Research Council (NRC, 1994), the MMS Alaska ESP is "extensive, substantive and high quality." However, the Alaska ESP has been challenged to meet its mission in an increasingly conservative fiscal environment. For example, the ESP's funding declined significantly since 1986. Despite this challenging situation, the ESP, at the national level and in all the regions including Alaska, remains committed to attaining quality environmental information.

The *Final Alaska Annual Studies Plan FY 2004* (prepared in July 2003) complements and reinforces the *Environmental Studies Program National Strategic Plan (NSP) 1998-2002*. The NSP has several broad themes, which include the following:

1. Monitoring Marine Environments
2. Seismic and Acoustic Impacts
3. Understanding Social and Economic Impacts
4. Oil-Spill Research Techniques
5. Efficient and Effective Information Management

To be responsive to changing programs, issues, and offshore technologies, the MMS Alaska Region proposes new studies and innovates in conjunction with the NSP themes. Due to the great differences existing between Alaska environments and other OCS areas, the uniqueness of the environment and related issues in Alaska underscores the need to be flexible in planning and implementation of needed studies.

Issues To Be Addressed

At each step of the offshore leasing and development process, a variety of potential issues or resource-use conflicts may be encountered. There are numerous issues and multiple-use conflicts related to offshore oil and gas development in Alaska. This section “Issues To Be Addressed” forms a framework for the section on “Identification of Information Needs.” As a result of issues characterized by uncertain information we identify specific Information Needs. Two questions are fundamental:

1. What is the expected change in the human, marine, and coastal environment due to offshore development and, therefore, expected change in benefits to humans from affected natural resources?
2. Can undesirable change be minimized by mitigating measures?

Environmental studies are often critical to answering both types of questions; and are expected to provide information useful to decision making in both regards. Currently the Alaska ESP has primary focus on upcoming developments, possible lease sales, and existing leases in the Beaufort Sea, Cook Inlet, Chukchi/Hope Basin, and Norton Basin Planning Area.

Current offshore oil- and gas-related issues for which studies are proposed to address in the Beaufort Sea, Chukchi/Hope Basin, and Norton Basin Planning Area include but are not limited to:

- What long term changes in heavy metal and hydrocarbon levels may occur near Beaufort Sea development prospects such as Liberty or regionally along the Beaufort Sea coast?
- What role will currents play in distribution of contaminants near development prospects?
- What long term changes in underwater industrial noise will occur and how might such noise propagate near development prospects relative to ambient noise levels?
- What are the effects of seismic exploration on the availability of bowhead whales for subsistence and other important marine species such as seals or fish?
- What changes might occur in habitat, distribution, abundance, and movement of key, potentially sensitive species such as bowhead whales, waterfowl, polar bears, other marine mammals, or fish?

- What interactions between human activities and the physical environment have affected these potentially sensitive species?
- What is the importance of future proposed or potential lease sale areas to feeding bowhead whales and overall bowhead population nutritional requirements?
- What potential contaminants are occurring in various sensitive species?
- What changes might occur in socioeconomics and subsistence lifestyles of coastal Alaska communities?
- What are current subsistence harvest patterns and what changes might occur in key social indicators as a result of offshore exploration and development?
- What changes might occur in sensitive benthic communities such as the Stefansson Sound “Boulder Patch,” other Beaufort Sea kelp communities or fish habitats?
- What refinements are there to our knowledge of major oceanographic and meteorological processes and how do they influence the human, marine, and coastal environment?
- How do we improve our projection of the fate of potential oil spills?
- If oil is spilled in broken ice, what will its fate be and how might it be cleaned up?
- What effects might pipeline construction have on nearby marine communities or organisms such as fish?
- How can we better integrate traditional knowledge of local residents into scientific processes and studies related to the Alaska ESP?

Similarly, there are a number of offshore oil- and gas-related issues that environmental studies in the Cook Inlet Region propose to address, including but not limited to:

- What long-term changes in heavy metal and hydrocarbon contamination have occurred in water and sediment quality?
- What refinements are there to our knowledge of major oceanographic and meteorological processes in Cook Inlet and Shelikof Strait and how do they influence the human, marine, and coastal environment?
- How do we improve our prediction of the fate of potential oil spills?
- What long term changes related to past or future activities have occurred in marine food webs, especially regarding key fish, seabirds and sensitive marine mammals?

- What are the effects of offshore oil and gas exploration or development on important socioeconomic activities such as commercial fishing or existing community infrastructures?
- What are the near term and long term effects on key economic activities such as sport fisheries?
- What are current subsistence harvest patterns and what changes might occur in key social indicators as a result of offshore exploration and development?
- How can we better integrate traditional knowledge of local residents into scientific processes and studies related to the Alaska ESP?

Participatory Planning

As proposals for exploration and development continue to evolve, Alaska's coastal communities on the Beaufort Sea are expecting increased involvement in project reviews and decisions that may affect their subsistence lifestyle. Since the people of Alaska's remote Arctic communities rely so heavily on subsistence resources of the marine environment, they are especially concerned about industrial activities that may directly or indirectly affect hunting success or the habitats of the species important to subsistence. They have an opportunity to comment on proposed and ongoing studies, especially those focused on the interactions of human activities and the natural environment.

Traditional knowledge has been incorporated into specific study planning, fieldwork, and interpretation of results over the years of the ESP. It is a continuing process to synthesize information from many projects into a broader, multi disciplinary view of research results. Past efforts such as MMS ITM's have helped us guide the design of future studies toward a more encompassing involvement of traditional information with scientific activities and results. Also of particular importance is the sharing of information between social and economic disciplines and other scientific fields. The process of melding traditional knowledge with other MMS studies varies from project to project, but the outcome of better information for decision making is a common goal.

Over the years, the MMS ESP has involved Alaskans and others in its research planning and execution in a number of ways. Solicitation of comments on the Alaska Annual Studies Plans (ASP's) has been practiced for years. The MMS ESP has sought out and included the knowledge of coastal community residents in planning. Another key source of input is discussion and advice on the ASP by the MMS Scientific Committee, which occurs on an annual basis. Other public involvement, such as participation on study project-management-review boards or scientific-review boards of certain studies, has assisted the MMS. In all MMS field-oriented studies, researchers coordinate directly with local communities to discuss their plans, seek advice, and assure that interested people learn about the project and its results. Recently, the MMS has incorporated local and traditional knowledge of Alaskan residents directly in the preparation of its EIS's and decision documents.

The MMS sponsored a Social and Economic Planning Conference in 1999. MMS Scientific Committee members, university professors, consultants, and MMS staff participated. For the Alaska Region discussions of major issues focused on impact assessment, monitoring key indicators, traditional knowledge, and stakeholder participation. The Alaska Region has taken the results of this Conference into consideration in preparing study profiles for proposed studies and scopes of work for studies to be contracted. Further information on this conference is available at <http://www.mms.gov/eppd/socecon/conference.htm>.

Coordination and Cooperation

The Alaska ESP through its day-to-day operations and ASP process:

- Coordinate plans and ongoing studies with other ongoing programs and research to assure optimal studies management and to manage budget resources efficiently.
- Enhance utilization of existing information.
- Share logistics and equipment.
- Enhance team approaches to interdisciplinary projects.

Currently a major portion of the program is conducted on a cooperative basis. In 1993, to take advantage of scientific expertise at the local level in addressing issues of mutual concern, the MMS developed the Coastal Marine Institute (CMI). Under an initial 5-year Cooperative Agreement with CMI, the MMS committed \$1,000,000 per year with a dollar-for-dollar match arrangement of Federal and State funds. The University of Alaska Fairbanks (UAF) School of Fisheries and Ocean Sciences, nationally recognized for its coastal and marine expertise, administers the Alaskan CMI. The cooperative agreement was renewed for another 5 years in 2002. In addition to funding CMI scientific research, a substantial portion of the MMS contribution supports education in Alaska by funding tuition and travel for UAF graduate-student research related to CMI projects.

The Alaska ESP also coordinates with other U.S. and local research entities such as the National Science Foundation, Arctic Research Commission, USGS- Biological Resources Division, *Exxon Valdez* Oil Spill Trustee Council research program, North Pacific Research Board, North Slope Borough Department of Wildlife Management, National Research Council, Polar Research Board, Cook Inlet Regional Citizens Advisory Council, industry programs, and others. Additional international linkages with the Canadian and Russian research and regulatory entities have been established.

Recently, the U.S. and seven other Arctic nations voluntarily agreed to cooperate on an Arctic Environmental Protection Strategy (AEPS) which has evolved into the formation of the Arctic Council in 1996. The Alaska ESP maintains contacts and coordination with Arctic Council activities, such as the Arctic Monitoring and Assessment Program (AMAP) and Conservation of Arctic Flora and Fauna (CAFF). The ESP provides information to these working groups through review of reports and plans, and helps to inform participants of available information sponsored by MMS. Further, specific studies that can coordinate and integrate with working group activities are identified and beneficial linkages facilitated.

Section 1.2 Projected OCS Activities

Prelease Considerations

This *Final Alaska Annual Studies Plan FY 2004* (prepared July 2003) reflects consideration of the proposed lease sales in the *Final Outer Continental Shelf Oil and Gas Leasing Program 2002-2007* (July 2002). In a frontier region such as the Alaskan Arctic with large and remote planning areas, potential environmental hazards associated with offshore activities, and still-developing technology required for hydrocarbon extraction, maximum lead-time is necessary to conduct adequate environmental studies.

The *Final Outer Continental Shelf Oil and Gas Leasing Program 2002-2007* proposes lease sales in the Beaufort Sea in 2003, 2005, and 2007; Chukchi/Hope Basin in 2004 and 2007; in Cook Inlet/Shelikof Strait in 2004 and 2006; and possibly in Norton Basin. For Norton Basin, MMS will issue a call for information and nominations and will move forward only if blocks are nominated and MMS decides to proceed forward with a lease sale. If this does not occur, the process will be repeated the following year and so on through the 5-year schedule until a sale is held or the schedule expires (see Fig.1). Studies proposed for FY 2003 are for EIS's and related NEPA analysis for these possible lease sales.

Preparation of the EIS is the most important part of the prelease process that requires environmental information. In particular, information is needed in time to prepare draft EIS's for proposed lease sales. Although much information exists for certain Alaska OCS lease areas, changing conditions and environments often lead to the need to update past studies so that EIS information is current and accurate.

Postlease Considerations

Prior to FY 1982, most studies of the Alaskan offshore were planned, conducted, and concluded before a sale was held to provide decision information for EIS's. However, not all information needs can be obtained prior to a sale. In accordance with mandates of Section 20(e) of the OCS Lands Act, as amended, postlease studies are needed to address environmental concerns and monitoring related to specific developments. The MMS acquires additional information for environmental analyses related to development and production in the postlease phase environmental analyses. Thus, an increasing number of studies have become more closely related to development schedules and monitoring and evaluation in addition to those broader studies related to the prelease phase. As with the prelease phase, the wide range of environmental conditions from Cook Inlet to the Arctic and planning lead times are accounted for in the process of formulating new studies for the ASP.

Postlease activities that raise issues and require environmental data and assessment are:

- Geophysical surveys.
- Exploration drilling.

- Development, construction, and production activity.
- Oil transportation, including pipelines and tankers.
- Lease termination or expiration (platform abandonment).

As of July 2003, exploration, artificial-island construction and abandonment, and unitization agreements (including suspension of leases) have occurred.

In the Beaufort Planning Area, there have been 716 tracts leased in eight OCS Lease Sales. There are currently 42 active leases (see Fig. 2). Thirty exploratory wells have been drilled and 11 were determined to be producible.

Beaufort Sea Planning Area Lease Sales

Sale BF - December 1979	Sale 71 - October 1982
Sale 87 - August 1984	Sale 97 - March 1988
Sale 124 - June 1991	Sale 144 - September 1996
Sale 170 - August 1998	

The British Petroleum Exploration Alaska (BPXA) Northstar development project is located about 10 miles north of Prudhoe Bay (see Fig. 2 and Fig. 3). While the Northstar Island is in State waters, 6 to 7 wells will be on the OCS. The project was approved by the U.S. Army Corps of Engineers May 1999 and by MMS September 1999. Construction started in the winter of 2000. Production started the last day of October 2001. Recoverable reserves are estimated at 158 million barrels of oil, with peak daily production estimated at 65,000 barrels per day.

A second BPXA proposed project is the Liberty Unit in Foggy Island Bay (see Fig. 2). It is located about 6 miles east of the State Endicott Project. MMS released the *Draft Environmental Impact Statement for the Liberty Development and Production Plan* (January 2001). In January 2002 BPXA put the Liberty project on hold. MMS issued the Final EIS for the project in May 2002. Recoverable reserves are estimated at 120 million barrels of oil.

AEC Oil & Gas (USA) Inc. filed a plan for exploration on McCovey in the fall of 2002 (see Fig. 2). MMS approved the plan in February 2002.

The only other active leases are in the Cook Inlet Planning Area. Cook Inlet Lease Sale 149 was held in June 1997 and generated two leases (see Fig. 4).

There are no active leases from previous lease sales in the Chukchi Sea or Hope Basin portions of the Arctic Subregion, or in the Bering Sea or Gulf of Alaska Subregions (see Fig. 1).

Section 1.3 Identification of Information Needs

We distributed the *Final Alaska Annual Studies Plan FY 2003* to approximately 200 Federal, State, local, environmental, Native, industry, international, and other stakeholders in July 2002. We distributed a letter to the same stakeholders requesting suggestions for new studies for the FY 2004 in September 2002. We considered comments in response to that request and previous

program reviews. In addition, we requested suggestions for new studies from all components of the Alaska OCS Region staff and considered their comments in identifying needed studies.

The ESP also relies heavily on information needs identified through solicitation of public comment and suggestions on how to enhance our information base at Information Transfer Meetings (ITM) and other meetings. For example an ITM was held in March 2003. Invitations for the ITM were sent throughout Alaska to State and Federal Agencies; borough, city, tribal, and village leaders; oil and fishing industry personnel; environmental groups; scientists; contractors; and others. Approximately 100 people, including about 30 MMS personnel, attended various sessions. Also, in March 2003, a second Beaufort Sea Information Update Meeting (IUM) was held in Barrow, with 11 presentations. At each of these meetings session chairs encouraged attendees to comment on the information available, either through oral participation in the question-and-answer periods or afterward in writing.

MMS sponsored a 2.5 day work shop on physical oceanography in the Beaufort Sea in February 2003 in Fairbanks, Alaska. The workshop started with presentations by 15 experts on various aspects of physical oceanography. Another 20 individuals participated. After discussion of the topic areas, the group recommended physical oceanography studies to support the MMS mission with respect to industrial development on this shelf or along the coast.

Several of the approved and proposed studies address recommendations from Cook Inlet communities and the Cook Inlet Regional Citizens Advisory Council (CIRCAC); and a few of the proposed studies also were highlighted in previous ESP plans.

Studies also address recommendations from the NRC on the Alaska ESP. A recent review entitled *Environmental Information for Outer Continental Shelf Oil and Gas Decisions in Alaska* (NRC, 1994) was conducted in response to a request from the U.S. House of Representatives that MMS seek NRC advice about the adequacy of environmental information for Beaufort Sea lease sales. The NRC committee concluded that the environmental information currently available for the Beaufort Sea OCS area is generally adequate for leasing and exploration decisions, except with regard to effects on the human environment (NRC, 1994: Executive Summary, p. 3). Since that time, the MMS has enhanced research components on the human environment.

The Alaska ESP has also considered a series of reviews of the national ESP by the NRC. The reviews are entitled "Assessment of the U.S. Outer Continental Shelf Environmental Studies Program." Volume I focuses on Physical Oceanography (NRC, 1990), Volume II on Ecology (NRC, 1992a), and Volume III on Social and Economic Sciences (NRC, 1992b); Volume IV summarizes Lessons and Opportunities (NRC, 1993).

MMS will work with affected Federal, State, local agencies, and tribes in a variety of ways to continue to address the many useful recommendations from the National Research Council in *Cumulative Environmental Effects of Oil and Gas Activities on Alaska's North Slope* (NRC 2003). We have already begun the process within MMS of addressing the recommendations relevant to the OCS.

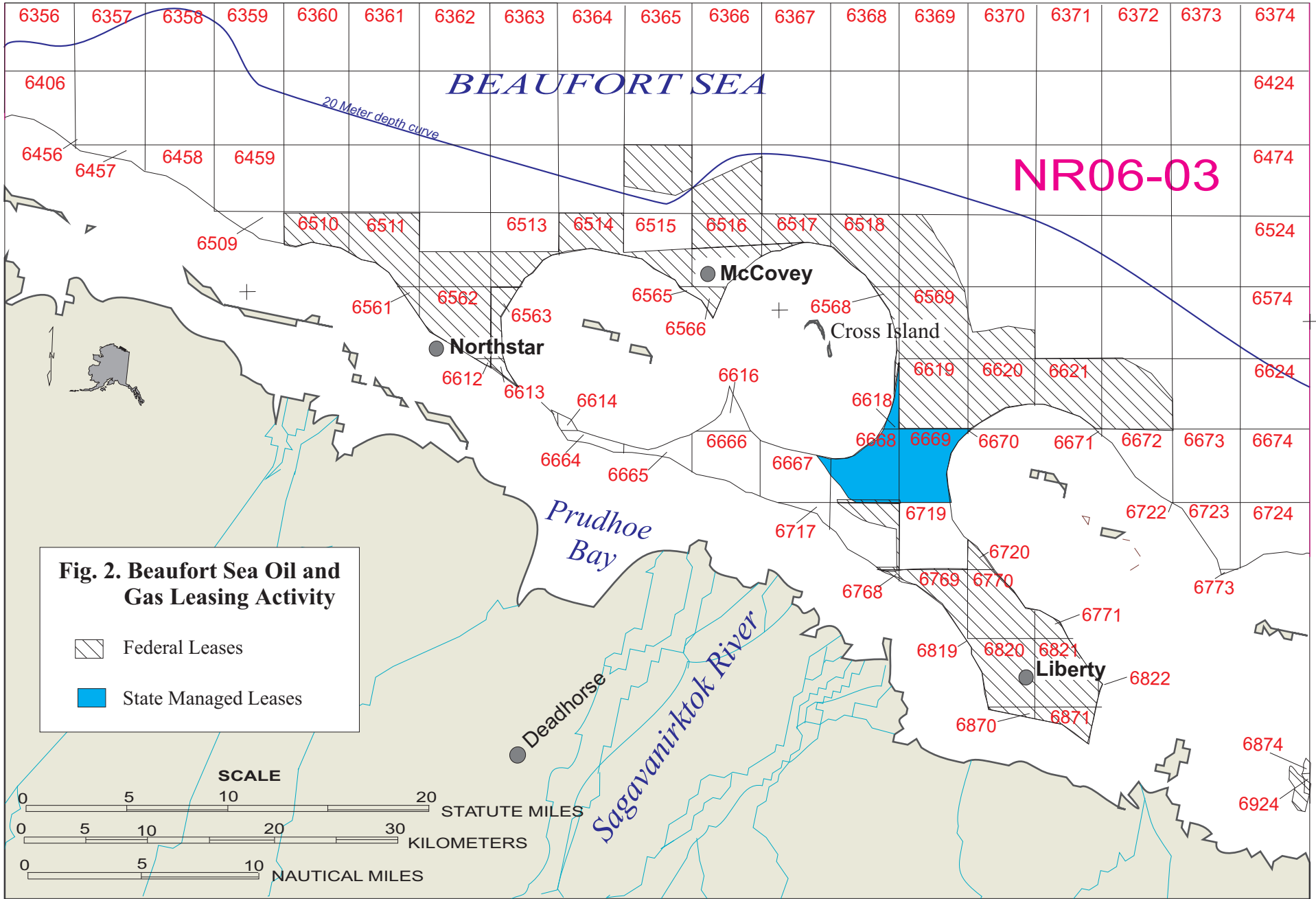




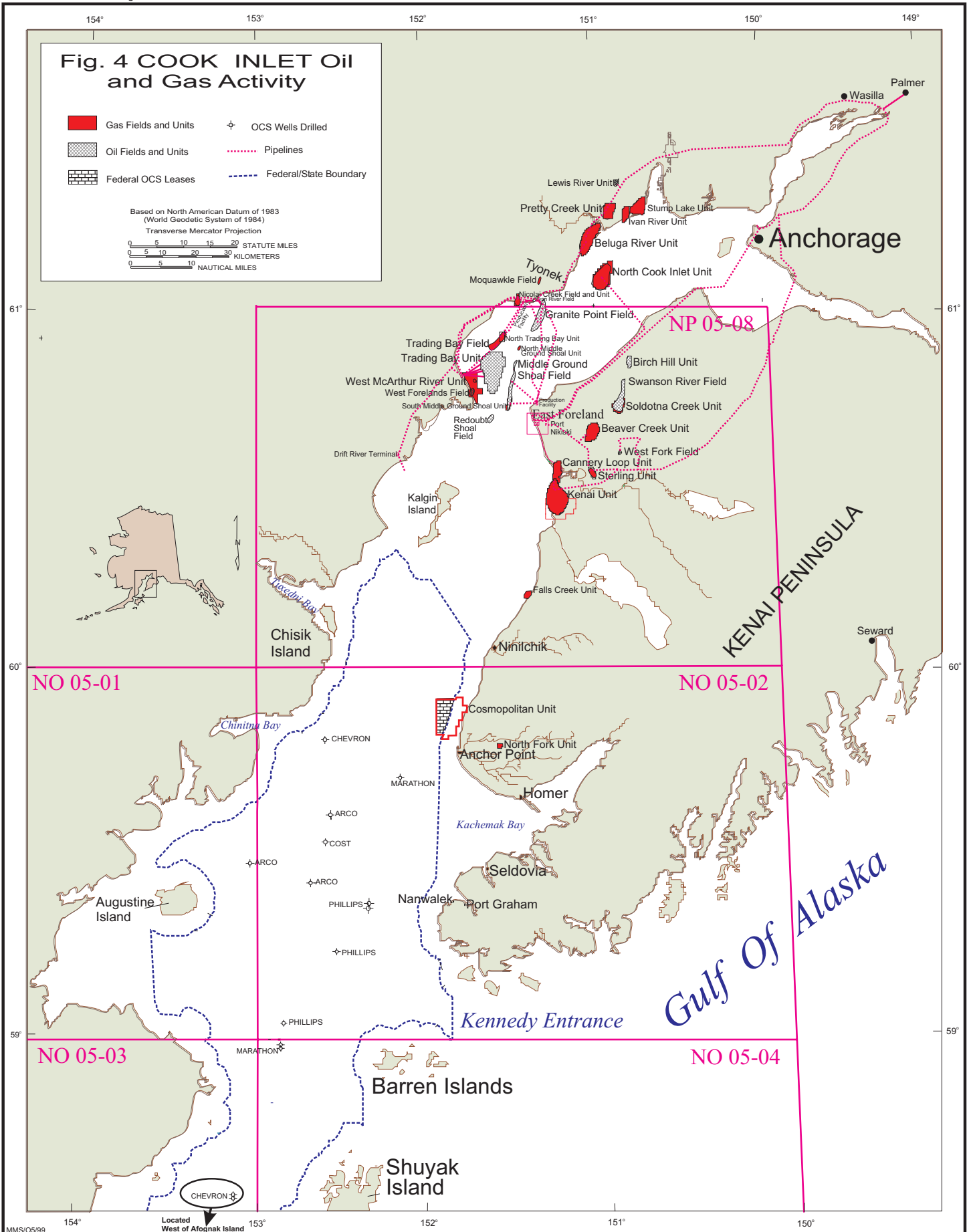
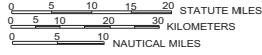
Fig. 3 Northstar Island looking north, September 2001. Production started in November 2001.

Fig. 4 COOK INLET Oil and Gas Activity

- Gas Fields and Units
- Oil Fields and Units
- Federal OCS Leases
- OCS Wells Drilled
- Pipelines
- Federal/State Boundary

Based on North American Datum of 1983
(World Geodetic System of 1984)

Transverse Mercator Projection



Beaufort Sea General Information Needs

Long-Range Monitoring of Interdependent Physical, Biological, and Social Processes:

Both offshore and onshore oil and gas development and production activities are increasing across Alaska's North Slope. Residents of Nuiqsut, Kaktovik and Barrow are particularly concerned about long term effects of offshore developments at Northstar and other possible developments as well as long-term and cumulative effects of any exploration from OCS Beaufort Sea lease sales. Interagency reviews of related EIS's and Development and Production Plans are expected to lead to additional recommendations for monitoring impacts of Northstar and other possible developments. Key constituents have identified the need to monitor under ice currents, sedimentation, and potential effects on social systems/subsistence in the vicinity of Northstar and Liberty developments. Related questions that need to be addressed are the characteristics of major oceanographic and meteorological processes and how they influence the human, marine and coastal environment. One method of collecting oceanographic data that has improved significantly in recent years is through radar mapping and this method should be investigated for the Beaufort Sea.

Information on Bowhead Whales and Other Wildlife: Inupiat whale hunters rely heavily on bowhead whales for subsistence. The bowhead whale is central to village cultural and spiritual life. Whale hunters have reported that migrating bowhead whales deflect from their normal migratory route well upstream of active seismic vessels and may divert their migration route far offshore. A concern is that deflection around oil- and gas-industry activity (including drilling activity and associated icebreaker support) forces whales farther and farther offshore, making them harder and more dangerous to hunt. Bowhead whales also feed along the fall migration route and information about bowhead feeding is needed. Noise from industrial activity is a central concern.

These concerns are addressed in part by ongoing studies such as the MMS Bowhead Whale Aerial Survey Project (BWASP) and the recently completed study titled "Bowhead Whale Feeding in the Eastern Alaskan Beaufort Sea: Update of Scientific and Traditional Information" (OCS Study MMS 2002-012). Analysis of other information on covariance of human activities and sea ice in relation to fall migrations of bowhead whales is underway. It is important to assess the factors that may be affecting the migration routes of bowhead whales.

The populations of bowhead whales, polar bears, beluga whales, spectacled eiders, and other endangered species are an ongoing concern of environmental groups, Federal agencies, and the International Whaling Commission. North Slope villages are particularly concerned about potential disturbance of ringed seals, waterfowl, and other subsistence-wildlife species by oil-industry activities such as helicopter overflights.

Native Culture: The Inupiat feel that their culture is vulnerable to short-term, long-term, and cumulative effects from OCS activities. They feel OCS activities might lead to:

- Social disruption and a change in cultural values through population shifts (immigration of large numbers of non-Inupiat to the North Slope).
- Employment changes (further displacement of the subsistence lifestyle by a cash economy).
- Cumulative effects of multiple industrial activities, alteration of subsistence-harvest patterns and displacement of hunters and subsistence resources.

The anticipated decline in oil revenues to the North Slope Borough is an issue of concern to the Natives also.

The Inupiat rely on a wide variety of marine resources as significant sources of food. In addition, the harvesting, sharing, and consuming of subsistence resources form an important part of the traditional Inupiaq culture and spiritual life. The Inupiat are concerned that a temporary or permanent elimination of primary subsistence foods would cause North Slope residents either to shift to less desired subsistence resources or to replace subsistence foods with expensive Western foods. The Inupiat are concerned about mitigation, including compensation, for potential losses. There is a need to monitor potential key indicators of socioeconomic and cultural changes of communities on the North Slope.

Another concern is the use of traditional Inupiaq knowledge in analysis of potential environmental effects; mitigation measures to protect environmental resources; and general offshore planning, leasing, and regulation of industry activity. We should continue to recognize and include firsthand knowledge of local subsistence hunters to augment the Western-science knowledge base.

Pollutants: North Slope villagers are concerned about potential effects on their food supply. In the Beaufort Sea, such foods include bowhead whales, seals, waterfowl, and fish. Of particular concern is the fate, behavior, and cleanup of a major oil spill and the potential mortality to marine wildlife in open water or effects resulting from entrainment of oil in sea ice. Other oil- and gas-industry activities are perceived to pose a threat of contamination through drilling mud disposal. Related to these concerns, additional information is needed regarding currents carrying oil under ice. The most current information on climate and ice is important to addressing these concerns.

Small portions of the Beaufort sea floor near the Liberty development unit have a special benthic environment referred to as the “kelp community” or the “Boulder Patch.” Sediments or pollutants associated with oil- and gas-industry activities could negatively affect this unique environment.

Chukchi/Hope Basin General Information Needs

Native culture relying on subsistence, particularly on marine resources, predominates in these regions. The fundamental issues in the Chukchi/Hope Basin are very similar to the Beaufort Sea. The major difference is that the last OCS activity in the Chukchi Sea was in the early 1990's and no OCS activity has occurred in the Hope Basin. MMS has

conducted studies in the Chukchi/Hope Basin but they are relatively fewer since the early 1990's compared to the Beaufort Sea. The *Final Outer Continental Shelf Oil and Gas Leasing Program 2002-2007* proposes Chukchi/Hope Basin Lease sales in 2004 and 2007. Several ongoing and recently completed studies provide environmental information to address information needs in the Chukchi/Hope Basin.

Cook Inlet/Shelikof Strait General Information Needs

Physical Oceanography: The MMS Oil Spill Risk Assessment (OSRA) Model needs additional validation in Alaskan waters. One method of collecting oceanographic data that has improved significantly in recent years is through radar mapping and this method will be further investigated for the Cook Inlet. Recent studies have been performed on surface currents in Cook Inlet. But more extensive information is needed particularly in middle and upper Cook Inlet.

Protected Species: A variety of protected species including, but not limited to, Steller's eiders, sea otters, harbor seals, beluga whales and humpbacked whales inhabit lower Cook Inlet and are potentially vulnerable to spilled oil and disturbance from oil development in the OCS. Updated information is generally needed on the distribution and habitat use patterns of these species for OSRA, for evaluation of the effects of disturbance and to facilitate planning for potential mitigation. For most of these species, information on distribution and abundance is most complete for the summer season when conditions are most suitable for observation. However, individuals of these species are likely to be locally abundant during all months of the year. Emphasis needs to be placed on surveys and studies of the status of lower Cook Inlet populations that are undertaken during the late-fall, early-spring and winter months.

Social Science and Economics: MMS needs information on social and economic assessment of major oil spill litigation settlement as relates to the potential effects of significant amounts of money that could be paid to people and organizations as a result of the *Exxon Valdez* oil spill. Information is also needed on mitigation of industry operations on drift net fishing. MMS also needs to research technical dialogue with Alaskan coastal communities and analyze the social, cultural, linguistic, and institutional parameters of public/agency communication patterns.

Norton Basin General Information Needs

The last EIS MMS prepared for this area was for Lease Sale 100 in 1984. Sale 100 was cancelled. If MMS initiates NEPA processes for a specific future lease sale in Norton Basin, information in all disciplines would need to be updated. However, the *Final Outer Continental Shelf Oil and Gas Leasing Program 2002-2007* proposes a new approach to leasing in this area. MMS will issue a call for information and nominations and will move forward only if industry nominates blocks and MMS decides to proceed toward a lease sale. A NEPA analysis will not be prepared prior to the request for nominations. Therefore it is possible the information update needs may be relatively limited. See Section 1.2 Projected OCS Activities for further explanation. Also Norton

Basin is on the schedule as a potential source of natural gas for local residents and businesses. Natural gas involves a smaller set of issues compared to those for OCS oil.

General Information Needs

The Alaska OCS Region has a need to have internet capability for the Sub-sea Physical Environmental Database.

We currently have an ongoing study “Update Oil Industry Labor Factors for the Alaska Manpower Model” which is nearing completion. The result of this study is a new model, called Arctic IMPAK. It has data primarily from 1999. Since 1999 different components have been added since the original study started in 1998. Another study, managed from the MMS Headquarters office has produced a parallel model, called Sub-Arctic IMPAK. This also has primarily 1998 data. Both of these studies are nearly completed. MMS Headquarters in coordination with MMS Regions is contracting for “OCS Economic Impact Models Upgrade Study” to be carried out in 2003-2005. This will include the MMS Alaska and Gulf of Mexico Regions. The updates from this study will result in consistencies of data between the two MMS Regions. It will also all for any new technologies in Alaska that were not considered in the Arctic and Sub-Arctic Manpower Models.

Section 2: Study Profiles

Section 2.1: Study Profiles for Ongoing Studies

The status of ongoing studies can be found at:

www.mms.gov/eppd/sciences/esp/profiles/alaska.htm.

This website is up dated three times each year and includes:

- An updated status of each study.
- Report due dates.
- Related publications.
- Affiliated websites.

For all completed ESP Studies go to:

mmspub.mms.gov/

This has the Environmental Studies Program Information System (ESPIS). ESPIS provides access to completed study products. It is a searchable, web-based, text retrieval system allowing users to view or download reports.

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2004

Region: Alaska
Planning Area: Beaufort Sea
Type: Cooperative Agreement with CMI
Title: Circulation, Thermohaline Structure, and Cross-shelf Transport in the Alaskan Beaufort Sea

Actual Costs (in thousands): **Period of Performance:** FY 1998-2004
FY1998 \$623
FY2000 \$20
Total Cost: \$643

Conducting Organization: CMI, UAF

Description:

Background Current, temperature, and salinity time series are largely unavailable for the Arctic Ocean, including in the Alaskan Beaufort Sea. Forcing and time and space scales are hypothesized rather than identified and confirmed. There are high inter-annual differences in flow and coastal salinity, but insufficient data to decipher whether these differences are due to long term trends or just inherent variability. Although there is salinity, temperature, and other data available for the Arctic Ocean, there is only one full year of cross-shelf mooring data along the Alaskan Beaufort coast. Data from elsewhere in the Arctic Ocean indicate that the oceanographic state of the Arctic Ocean may have changed since the earlier study. This study will provide a second year of data.

Objectives

1. Estimate the mean transport over the outer continental shelf and slope and the cross-shelf and vertical scales of the mean flow field.
2. Estimate the magnitudes of transport variability and the dominant temporal and spatial scales associated with this variability.
3. Estimate the relation between variations in temperature and salinity and variations in the flow field at time scales between the synoptic to the seasonal. Evaluate whether changes in the baroclinic flow are consistent with changes in the cross-shelf density structure.
4. Estimate the cross-shelf fluxes of heat, salt, and momentum. Evaluate whether these are related to instabilities (eddy generation mechanisms) of the littoral flow.

5. Estimate the relationship between observed flow and density variations and the surface wind field.
6. Compare the results obtained from the proposed field program with those collected in 1987/88 in prior MMS research, to evaluate whether recent large changes in the Arctic Ocean are also reflected in the Beaufort Sea.
7. Combine this data set with other measurements recently acquired from around the Arctic Ocean to provide an updated synthesis that relates the Beaufort Sea to the large-scale circulation of the Arctic Ocean.

Methods Moored instruments were deployed along the outer shelf and slope of the Alaskan Beaufort Sea. Five of the moorings were recovered after one year, in 1999. The sixth mooring could not be recovered in 1999, and will be recovered in 2000. The mooring data will be supplemented by hydrographic profiles collected during the mooring deployment and recovery cruises on a cross-shelf transect along the 147° W meridian.

Importance to MMS Understanding the physical oceanography of the Beaufort Sea is a necessary precursor to establishing accurate and reliable oil spill trajectory models. Results from such models are an important part of EIS analysis of proposed lease sales and choosing among alternatives. Oil-spill issues involving or resolvable by the trajectory model constitute half the public comments submitted on NEPA documents for decision-making on proposed offshore oil- and gas-lease sales on the Alaska OCS.

Date Information Required: Study results will be used for post-lease NEPA documentation for the proposed Beaufort Sea Lease Sales in 2003, 2005 and 2007. The data will also be useful in evaluating development plans being submitted for the Beaufort Sea.

Revised date: September 2003

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2004

Region: Alaska
Planning Area: Beaufort Sea
Type: Contract Modification
Title: Synthesis and Collection of Meteorological Data in the Nearshore Beaufort Sea: Extension

Actual Cost (in thousands):	Period of Performance: FY 2000-2005
FY 2000 \$210	
FY 2003 \$99	
FY 2004 \$110	
FY 2005 \$36	
Total Cost: \$454	

Conducting Organization: Hoefler Consulting Group

Description:

Background Future development in the Alaska OCS will be in the nearshore region of the Beaufort Sea. We are collecting a multi-year wind time-series set of meteorological data for the North Slope oil fields at Northstar, Milne Point, Endicott and Badami. All stations have been collecting data since January 2001. The web site has been operating very well, providing data and pertinent information on the data collection effort. The web site URL is www.resdat.com/mms. There have been some technical and logistical problems with two of the meteorological stations. The station at Endicott is a remote site without hard line power. Since the station does not have hard line power, there have been some recurring problems with maintaining power and keeping the instruments frost free and operational during the months of late November through February.

We know from Kozo's research in the 1970's and 1980's that the upper air pressure fields, on which modeled wind fields used in Arctic regional circulation models are based, give increasing inaccurate results for surface winds within 20-30 kilometers of the Beaufort Sea coast. In OCS areas off the contiguous 48 States and in the Bering Sea, MMS has established a network of meteorological buoys to monitor the lower atmosphere over long periods (10 years). Recent CMI studies comparing simulated winds from different Arctic and hemispheric wind models to Pt. Barrow winds are not relevant to this study. This is because along the Beaufort Sea coast towards the east, orographic and sea breeze effects are too great.

Objectives The objectives of this study are to continue to collect meteorological data in Beaufort Sea locations subject to current and proposed development. This study will add an additional year of data. This study will develop a wind time series for oil weathering models and sensitivity testing of MMS's nearshore and general regional circulation and trajectory models for the Beaufort Sea.

Methods The methods of this study are to:

1. Continue to collect an additional 1-year wind time series from Northstar, Endicott and Milne Point, Badami.
2. Provide replacement parts as necessary for existing stations from previous study.
3. Add an additional station site to an offshore island.
4. Maintain the original four stations and one additional station from January 2003-January 2004.
5. Provide additional historical meteorological data (pre 1985, wind speed/wind direction data) beyond what was originally requested in a standardized format.
6. Coordinate collection of time series data with Alaska Department of Environmental Conservation efforts in its Air Quality and Industry Preparedness and Pipeline Programs.
7. Conduct cross-correlation statistical analysis of wind time-series data from Barrow, Deadhorse, Northstar, Endicott, Milne, Badami, and other relevant data sets.
8. Synthesize all existing North Slope meteorological station data from 2003 forward into an MMS-compatible database.

Importance to MMS The MMS uses circulation models requiring meteorological information in EIS's, other environmental assessments, and oil-spill contingency planning. This information would be used in the MMS oil weathering model, the proposed nearshore circulation model, COZOIL, and would provide meteorological data to concurrent field. The database will be used in validating the 10 m windfields that the MMS uses in the Arctic Regional Circulation Model and Oil Spill Trajectory Analysis.

Date Information Required: This study will support enhancement of circulation models and review of future oil-spill contingency plans. The information will also be used for post-lease NEPA documentation for Beaufort Lease Sales in 2003, 2005, and 2007, and DPP's.

Revised date: September 2003

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2004

Region: Alaska

Planning Area: Beaufort, Chukchi, Bering and Cook Inlet

Type: Cooperative Agreement with CMI

Title: Alaska Sea Ice Atlas

Actual Costs (in thousands):

FY 2000 \$195

Total Cost: \$195

Period of Performance: FY 2000-2004

Conducting Organization: UAA

Description:

Background The most recent compilation of ice data information for the U.S. Beaufort Sea included a Beaufort Sea Atlas (compiled by Sohio in 1984) and an Alaskan Ice Atlas covering 1970-1983. In 1995, the National Ice Center (NIC) digitized the 1972 – 1994 unclassified hardcopy sea ice chart archive using services provided by the National Climatic Data Center (NCDC) in Asheville, NC. The charts were digitized as vector data, and then converted to ASCII gridded fields in the World Meteorological Organization's Sea Ice in Gridded Format. These data have 25 km resolution. Biweekly ice coverages are currently available from the National Ice Center in ARC/INFO for the years 1996-1999. Digital files of historical records may also exist with the Canadian Ice Center for the Beaufort Sea. . Historical records of summer ice severity in the Alaskan Beaufort now date back to 1952 (44 years). Evidence shows that the 1990's have produced mild summers in keeping with warmer record temperatures worldwide. These changes in temperature need to be factored into MMS Beaufort Sea activities, both for lease sales EIS's and subsequent exploration or development and production activities. These conditions must be included in an updated modern summary of ice condition in the Beaufort Sea and along the Alaskan coast. Information has not been updated/consolidated since the mid-1980's. The budget for this study assumes 25 percent participation from other interested agencies.

Objectives The goal of the study is to provide accurate high resolution digital sea ice products for the Beaufort Sea. The data will be used to evaluate ice conditions for current and proposed oil and gas development plans, review exploration plans, and for EIS's. The sea ice data will be incorporated into the MMS environmental database, accessible by ARC/INFO/ArcView.

Specific objectives include:

1. Compiling and quantifying sea ice data collected from the 1970's through the 1990's into digital and geospatial formats.
2. Providing up-to-date description of Beaufort Sea ice environment for ongoing and future

activities.

Methods

1. Inventory existing reports, databases, and baseline studies.
2. Formulate a design plan for ice subjects of key interest, mapping requirements; tables; graphs, and other software enhancements which best portray information needs (i.e., ice growth, frequency of ice invasions, etc.) in user-friendly manner.
3. Prepare updated digital atlas which includes maps, tables, and graphs to cover: fast ice stability and ice movements (late May to early September); summer nearshore ice invasions (September to September) and ice growth during winter (December to April).
4. Prepare a retrievable database of sea ice coverages, user interface and analysis tools in Arc/Info.

Importance to MMS MMS will be better able to review development and production plans with the most up-to-date ice data. The maximum and minimum dates for ice formation and earliest and latest dates for projected use of ice leads are important variables in these plans. The most recent data on ice through 1983 does not reflect the warming climatic trends since 1983. The study will enable MMS to provide improved NEPA analysis for activities permitted by MMS.

Date Information Required: This updated ice information will be used for EIS's and EA's for potential DPP's after FY 2004.

Revised: September 2003

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2004

Region: Alaska
Planning Area: Cook Inlet
Type: Cooperative Agreement with CMI
Title: Water and Ice Dynamics of Cook Inlet

Actual Costs (in thousands):	Period of Performance: FY 2002-2005
FY 2002 \$617	
FY 2004 \$323	
Total cost: \$940	

Conducting Organization: CMI, UAF

Description:

Background The Cook Inlet tidal regime is among the most complex in the United States because of the large tidal range, extensive mud flats, strong currents, severe weather, and seasonal ice cover. Most physical oceanographic data supporting the model is derived from a comprehensive NOAA circulation survey of Cook Inlet carried out from 1973-1975. A few modest Lagrangian surface current studies have been performed in the Cook Inlet/Shelikof Strait. Burbank (1977) released drifters in and near Kachemak Bay; Muench, Schumacher, and Pearson (1981) released drifters from lower Cook Inlet; and Reed and Stabeno (1989) released drifters in the lower Shelikof Strait. The latter study released a small number of oil-spill-simulating drifters for the purpose of testing how well these drifters would follow an actual oil spill, in this case the Exxon Valdez spill.

The MMS has used a variety of ocean models to estimate water and oil movement in Cook Inlet. Most recently, MMS has used an in-house version of the Princeton Ocean Model. In 1999, MMS co-sponsored a Cook Inlet Oceanography Workshop [OCS Study MMS 2000-043]. The workshop recommended that Cook Inlet models be improved and validated in parallel with acquisition of improved observational data.

Objectives The objective of this work is to successfully simulate the sea ice and water dynamics in Cook Inlet and validate the simulations with observational data.

Methods A combination of 2-d models and a 3-d model, the Regional Ocean Model System (ROMS) because it has been configured to Cook Inlet, will be used and compared to observational data. An improved Cook Inlet bathymetry needed for the modeling has been obtained from commercial and government sources. Scatterometer satellite observations will provide winds to the models.

Drifters are a primary data source. These include oil-following drifters provided by MMS and water following drifters with combined GPS and ARGOS capabilities.

SAR imagery is being obtained concurrent with drifter and other field measurements to obtain broad scale information on tide rips.

Importance to MMS This project will enable MMS to improve its oil-spill risk modeling applied to Alaskan waters. This in turn will enhance the credibility of MMS Cook Inlet EIS's and related NRPA documentation. Public acceptance of OSRA results and analyses will be enhanced if accompanied by supporting drifter data for Alaskan waters.

Date Information Required: Data collection will be ongoing and the information will be fed into our data processing and analysis procedures.

Revised date: September 2003

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2004

Region: Alaska
Planning Areas: Beaufort Sea, Cook Inlet
Type: Cooperative Agreement with CMI/Contract Task Order
Title: Surface Circulation Radar Mapping in Alaskan Coastal Waters:
Planning/Feasibility Study

Actual Costs (in thousands): **Period of Performance:** FY 2003-04
FY 2002 \$46
Total Cost: \$46

Conducting Organization: MBC Applied Environmental Sciences

Description:

Background Over the past 25 years, oceanographic radar techniques (Coastal Ocean Dynamics Application Radar [CODAR] and Ocean Surface Current Radar [OSCR]) have been developed and improved to where detailed, gridded, 2-dimensional maps of surface circulation can be provided and recorded in real time. CODAR was partially developed in work for MMS in Cook Inlet two decades ago, but that developmental system did not provide useable data. More modern radar systems have been successfully used since in MMS-funded studies in offshore North Carolina, Central Gulf of Mexico and offshore Southern California.

Currents play a critical role in the transport and fate of spilled oil, but there is paucity of direct circulation measurements in some areas of the Beaufort Sea and Cook Inlet. Current meters provide data only at specific sub-surface points and not at the water surface, where the oil would be. These radar techniques provide a measured equivalent of a gridded circulation model and can be used as input to or validation for oil spill trajectory models.

Several entities, including MMS, NOAA, the Prince William Sound Oil Spill Recovery Institute, the University of Alaska Fairbanks, and oil industry have expressed interest in using circulation mapping radar techniques in Alaskan coastal waters, but no user-group or specific program has been developed for radar use. The radar units are expensive and cost and use-sharing rental agreements among multiple users is a preferred approach.

Objectives The objectives of this co-funded feasibility and planning study are to develop an Alaska circulation-mapping-radar users group and develop cost-effective strategies for radar mapping in the vicinity of likely oil development in the Beaufort Sea (especially the Liberty Prospect) and for Cook Inlet OCS and adjoining waters. Sharing and multiple uses are necessary to reduce rental cost of the radar system. Other members of the users group may have interests in other waters. A Phase II program, to display radar systems, could result from this study.

Methods

1. Establish who potential radar users are and develop communication links.
2. Hold workshop to form a broad agency/academic/industry users group. In addition to physical oceanography, potential biological and fate/effects uses should be considered and potential users invited.
3. Develop information on advantages and disadvantages of competing radar systems for Alaska use. Include:
 - Costs
 - Resolution (2-D and velocity),
 - Deployment issues (footprint, height, number of radar units needed, etc.)
 - Arctic and subarctic specific maintenance issues (e.g., temperature constraints, remote locations, power supply)
 - Effects of ice concentration on radar measurements

Specifically look at limitations of use for near the Liberty prospect in the coastal Beaufort Sea and in Cook Inlet.

4. Develop strategies and priorities for radar mapping in the vicinity of likely oil development in the Beaufort Sea (especially the Liberty Prospect) and for Cook Inlet OCS and adjoining waters, taking into account cost-sharing possibilities among multiple users and coordination with other studies such as the MMS nearshore Beaufort Sea current meter moorings and proposed Cook Inlet drifter study.

Importance to MMS The Oil-Spill-Risk Analysis (OSRA) is a cornerstone to regional EIS's environmental assessments, and oil-spill-contingency planning. MMS is being tasked with providing circulation and oil-spill-trajectory information at higher resolution than feasible or justifiable by state-of-the-art modeling or current-meter technology. Oil-spill issues constitute a significant portion of public comments submitted on sale or development EIS's in the Alaska OCS Region.

Date Information Required: For post-lease NEPA documentation for Beaufort Sea Lease Sales in 2003, 2005, and 2007 and in reviewing and improving oil-spill-contingency plans, including any for the Liberty project, if approved and constructed.

Revised date: September 2003

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2004

Region: Alaska
Planning Areas: Cook Inlet
Type: Cooperative Agreement with CMI
Title: Observations of Hydrography in Central Cook Inlet, Alaska, during Diurnal and Semidiurnal Tidal Cycles

Actual Costs (in thousands): **Period of Performance:** FY 2003-2004
FY 2003 \$10
Total Cost: \$10

Conducting Organization: CMI, UAF

Description:

Background This project is designed to observe the variability of the baroclinic structure (density/ pressure) in central Cook Inlet during diurnal and semidiurnal tidal periods. The baroclinic response to tidal forcing has not yet been documented in Cook Inlet. Transmissivity profiles will provide estimates of suspended sediments. Suspended sediment estimates, along with salinity measurements, are useful for distinguishing between inlets and oceanic water masses.

Objectives

1. Acquire multiple vertical profiles of temperature, salinity, and transmissivity along a transect crossing central Cook Inlet.
2. Cover a 25 hour period so as to document the evolution of physical oceanographic properties during diurnal and semidiurnal tidal cycle.
3. Relate principal tidal cycles to the density-driven (baroclinic) flow in Cook Inlet

Methods

1. Sample during calm seas in June of 2003 using a 26-ft, twin-125hp outboard vessel for conductivity, temperature and depth (CTD) measurements.
2. CTD casts at 1 –to-2 nautical mile spacing along a transect from the western shore of the Kenai peninsula to Kalgin Island.
3. Reoccupy the station locations for CTD casts during a diurnal tidal cycle and two semidiurnal tidal cycles, a total of 10 times at each station.

Importance to MMS Information from this study will be used for post-sale NEPA documentation for Cook Inlet Lease Sales in 2004 and 2006.

Date Information Required: For post-lease NEPA documentation for Cook Inlet Lease Sales in 2004 and 2006, and DPP's.

Revised date: September 2003

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2004

Region: Alaska
Planning Areas: Cook Inlet
Type: Cooperative Agreement with CMI
Title: High-Resolution Numerical Modeling of Near-Surface Weather Conditions over Alaska's Cook Inlet and Shelikof Strait

Actual Costs (in thousands): **Period of Performance:** FY 2003- 2006
FY 2003 \$300
Total Cost: \$300

Conducting Organization: CMI, UAF

Description:

Background Along the north Gulf of Alaska coast, terrain plays an important role in determining local weather. The interaction of terrain with synoptic and mesoscale pressure gradients frequently produce gap and channel winds, often called low-level jets in places like Cook Inlet and Shelikof Strait. These winds may at times be quite strong, with gusts occasionally exceeding 50 meters per second. These winds are not currently included in existing wind modeling products used to drive Cook Inlet circulation and oil spill models.

Objectives Develop an atmospheric modeling capability for the Cook Inlet/Shelikof region suitable for nowcast/forecast and research purposes. Use the model to:

1. Systematically study low-level wind jets and other wind and precipitation phenomena in Cook Inlet and Shelikof Strait.
2. Develop an understanding of the mechanisms which drive low-level wind jets in the region.
3. Develop a climatology of low-level jet occurrence and likelihood in wind-prone locations.
4. Study the vertical and thermal structure of wind jets.
5. Study the cloud fields and precipitation associated with high wind events in the region.

Methods The modeling will use the parallel computing capability being developed at the Alaska Experimental Forecast Facility in Anchorage. An automated modeling system will run daily, using current initialization data that comes to the facility via a dedicated T1 line from the National Weather Service in Alaska. The model will produce real time, three-dimensional data sets of winds, pressure and temperature throughout the troposphere and lower stratosphere.

Accurate topography and nested, finer grids in preliminary model runs result in development of the jets.

Importance to MMS Low-level wind jets occur in Cook Inlet and Shelikof Strait but are not captured by currently used wind products. Such jets affect oil spill trajectories to unknown degree. This study will provide high resolution wind fields incorporating the jets which will improve the reliability and accuracy of MMS's circulation and spill trajectory models in Cook Inlet and Shelikof Strait.

Date Information Required: For post-lease NEPA documentation for Cook Inlet Lease Sales 2004 and 2006 and in reviewing oil spill contingency plans.

Revised date: September 2003

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2003

Region: Alaska

Planning Areas: Beaufort Sea, Chukchi Sea, Hope Basin

Type: Interagency or Joint Funding

Title: Sea Ice Modeling for Nearshore Beaufort and Chukchi Seas

Actual Costs (in thousands):

Period of Performance: FY 2003-2007

FY 2003: In Procurement, TBD

Description:

Background The MMS will use the results of the FY 2002 sea ice modeling workshop to focus on what MMS needs from this next generation, sea ice modeling effort. Thus objectives, method, and cost estimate will be revised per workshop results. MMS contributed to recent general “ice” workshops in Alaska and Japan that have dealt with ice engineering and oil-spill response in ice rather than the specific problem of modeling fine scale ice/ocean and ice/ice interactions.

Most basin-scale dynamic-thermodynamic models in general use relatively simple thermodynamics and ice thickness distribution approximating the ice as slabs of a one to few meters mean thickness plus open water. While sufficient as a first approximation of the arctic ice pack, this treatment lacks the ability to sufficiently resolve the spectrum of ice thickness from thin new ice to thick ridged ice to fast ice that have been observed. In addition, the ice models in current state-of-the-art coupled ice/ocean models, including those current Rutgers and CMI models contracted by MMS, are based on empirical ice physics valid at a 100-km scale and extrapolated to smaller grid dimensions.

Development of new generation ice model has been proposed as a joint interagency funding project to MMS, Office of Naval Research, and National Atmospheric and Space Administration. For MMS purposes, this new generation ice model would need to improve modeling in two specific areas: spatial resolution and nearshore interactions. The resolution of ice models and ice data needs to be increased to address fine scale interactions necessary to model oil spill trajectories in the nearshore Beaufort and Chukchi Seas, including within and among barrier islands. Formation, extent, and persistence of landfast ice need to be accurately portrayed.

Objectives The objective of this study is to improve the state of the art in ocean-ice or ice modeling and to produce either a stand alone ice/ocean model or an improved ice model that can be coupled to and or nested in the current MMS ice/ocean model. The existing or new model would be applied to the nearshore Beaufort and Chukchi Seas to predict the formation and melting of fast ice and the movement of broken ice fields, including within and among barrier islands.

Methods

1. Participate in interagency working group to co-fund new generation ice model.
2. Develop new ice model based on smaller scale parameterization and inclusion of nearshore interactions (islands, landfast ice, etc.).
3. Produce stand-alone ice/ocean model or couple the ice model to the current MMS ocean model.
4. Run coupled model simulations.
5. Conduct sensitivity testing and validation of the model results.

Importance to MMS The importance to the MMS is to increase the accuracy of estimates of oil spill movement in ice in the Beaufort and Chukchi Seas. Current models are suspect inshore and the 1 to few km resolution. This study will help resolve modeling issues for the Alaska OCS Region, increase confidence in the models used by the OCS Program, and help in review of oil-spill-contingency plans.

Date Information Required: This study will start the year after completion of the sea-ice modeling workshop. It is a long-term study to advance the state-of-the-art, and its completion is not date-critical. However, to show ongoing research in this area is necessarily to maintain faith with key Beaufort stakeholders. The information will also be used for post-lease NEPA documentation for Beaufort Lease Sales in 2003, 2005, and 2007, and DPP's.

Revised date: September 2003

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2004

Region: Alaska
Planning Area: Beaufort Sea
Type: Competitive or Interagency
Title: Beaufort Sea Nearshore Currents

Actual Costs (in thousands): **Period of Performance:** FY 2003-2006
FY 2003: In Procurement, TBD

Description:

Background Understanding the under-ice and open water currents through a long term time series is a necessary precursor to estimating potential effects on sensitive resources from oil spills or in the landfast ice. A current ongoing study will provide measurements from three locations within the barrier islands of Stefanson Sound near Northstar and Liberty for 1999-2000, 2000-2001, and 2001-2002. The ongoing study has provided the first current, temperature, and salinity data covering the entire freeze up, winter, and breakup periods in the nearshore Beaufort Sea. Preliminary evidence suggests that in the future, a single mooring would suffice in capturing the along-lagoon flow in this region of Stefanson Sound.

Other areas of the Beaufort Sea have different current regimes and have not been sampled for under-ice currents and only limited open water currents. Lagoons in the eastern Alaskan Beaufort Sea have narrower passes between the barrier islands, causing a pulsed circulation in and out of the lagoons. These passes are important due to their potential to funnel flow and oil spills into the lagoons. Camden Bay, also to the east, is not protected by barrier islands and represents a third type of coastal flow regime. The only current meter moorings for these eastern Beaufort Sea coastal regimes were a small oceanographic program in summer 1988 and 1989.

Objectives

1. Measure currents, temperature, and salinity hourly at three locations in the landfast ice zone; one in the vicinity of Liberty and Northstar and two in new locations with different flow characteristics.
2. Quantify the magnitude of current variability and to describe the relationship between currents and local winds.
3. Estimate the vertical structure of the currents throughout the water column and how the structure changes with the development of the landfast ice through the winter and in summer when the ice melts and rivers flood the inner shelf.
4. Provide physical oceanographic data to the continuation of the Arctic Nearshore Impact Monitoring in Development Areas (ANIMIDA) study.

Methods

1. A 1200 kHz acoustic Doppler current profilers (ADCPs) will be moored for one-year periods, recovered, and redeployed for total of 3 years. All three moorings will have conductivity temperature depth measuring devices (CTD's) and transmissometers.
2. Any mooring outside the barrier islands will require acoustic modem technology to allow periodic winter downloading of data from the mooring.
3. Local winds measured at Deadhorse, Northstar, Endicott, Oliktok and Badami and sea level data collected at the Waterflood facility will be collated for time-series comparison with mooring data.
4. Standard physical oceanographic time-series analyses (e.g., univariate statistical descriptors and correlation in both time and frequency domains) and velocity shear calculations will be done.

Importance to MMS This study will be useful to MMS to validate the oil spill risk analysis model. It will provide understanding for oil spill contingency planning in areas outside the barrier islands versus inside the barrier islands.

Date Information Required: This information will be used to evaluate oil spill contingency plans for Liberty, if approved, and other developments. It would also be used for post-lease NEPA documentation for Beaufort Sea Lease Sales in 2003, 2005, and 2007, and DPP's.

Revised date: September 2003

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2004

Region: Alaska
Planning Areas: Beaufort Sea
Type: Competitive or Interagency
Title: Mapping and Characterization of Recurring Spring Leads and Landfast Ice in the Beaufort Sea

Actual Costs (in thousands): **Period of Performance:** FY 2003-2005
FY 2003: In Procurement, TBD

Description:

Background Spring leads in the Beaufort Sea occur every year to the east of Barrow. The size, frequency, and latitudinal extent of these leads, particularly further east from Barrow, are poorly known. In recent years, we have become aware that the Arctic Ocean, and especially the Beaufort Sea, responds to alternating climate states lasting a few to several years. A primary difference between the two alternating states is a weakening or reversal in the Beaufort gyre. Superimposed on, and interacting with the alternating climate states, is the estimated 40 percent thinning of Arctic ice pack over the last 30 years. The effects of climate state and ice thinning on spring lead characteristics in the Beaufort Sea are unknown.

Better information on how spring leads and moving ice pack interact is another issue, because this interaction is the key to how much risk spilled oil encapsulated in pack ice has to localized biota. Bowhead whales migrate past Barrow along these leads and westward, toward the Canadian Beaufort in the spring. The leads are also heavily used by spring migrating waterfowl. Risk from encapsulated oil would be less if the ice pack diverges along the lead lines as opposed to breaking up and crossing the leads.

The spatial location of landfast ice on a monthly basis is known in only a very generalized sense as shown in climatic or ice atlases. The new MMS sponsored sea ice atlas is being developed from the Joint Ice Center products, which are at a 25 km grid resolution and are too coarse for the detail needed. The spatial distribution of landfast ice was documented in the Beaufort Sea by Stringer in the mid 1970's on a seasonal basis. The seaward limit of stable fast ice defines where under-ice pooling of spilled oil might take place and where fast ice conditions apply to design and operation of offshore facilities. It defines the location where no ice movement occurs. It is also the extreme landward boundary of possible whale migration routes during the springtime migration period.

Objectives

1. Document locations of recurring spring leads to the east of Barrow, and their extent across the Alaskan Beaufort Sea.

2. Document temporal and spatial occurrence of shoreward landfast ice line across the Alaskan Beaufort Sea to the Canadian McKenzie Delta.
3. Examine the effect of climate on lead and landfast ice characteristics.
4. Examine the effect of ice thinning on lead and landfast characteristics
5. Document dominant spring lead/ice pack interaction mode(s).
6. Map average monthly shoreward land fast ice line.

Methods

1. Review and synthesize literature and local information sources.
2. Synthesize and analyze current and historical remote-sensing imagery of recurring spring leads and shoreward landfast ice line.
3. Create geographic information system files summarizing the spatial distribution of spring leads in the Alaskan Beaufort Sea. Provide individual years as well as statistical representation of lead occurrence and distribution.
4. Create geographic information system files showing the monthly distribution of the shoreward landfast ice line across the Alaskan Beaufort Sea to the Canadian McKenzie Delta.
5. Provide individual months per year as well as statistical representation of landfast ice occurrence and distribution.
6. Provide relevant attributes to spatial data for use in a geographic information system.

Importance to MMS Because the predominant movement of a potential oil spill in the Beaufort OCS Planning Area would be from east to west, the potential interaction of oil and wildlife in spring lead system westward is a major concern. A better understanding of locations and characteristics of the spring leads would allow more accurate estimate of oil spill risk to the biota. New information on both the temporal and spatial aspects of landfast ice is the foundation for improving the oil spill risk analysis. Monthly winter landfast ice location would be a significant improvement over a seasonal winter location in use today. In addition this information is useful for validating ice models.

Date Information Required: This study meets an ongoing need for future sales, oil spill contingency planning, and for post-lease NEPA documentation for Beaufort Sea Lease Sales in 2003, 2005 and 2007, and DPP's.

Revised date: September 2003

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2004

Region: Alaska
Planning Areas: Cook Inlet
Type: Cooperative Agreement with CMI
Title: Measurements of Temperature, Salinity, and Circulation in Central Cook Inlet, Alaska

Actual Costs (in thousands): **Period of Performance:** FY 2003-2004
FY 2002 \$26
Total Cost: \$26

Conducting Organization: CMI, UAF

Description:

Background

Improved understanding of density-driven circulation in Cook Inlet is needed for development of more sophisticated oil spill models. Present oil spill models for Cook Inlet are two dimensional and lack sufficient data in Cook Inlet to develop more useful three dimensional models. That is, they model only surface distribution of an oil spill. Developers of local numerical circulation/spill trajectory models and planners of Geographical Response Strategies need ground-truth measurements by which their respective models and operational plans can be validated and improved.

Objectives

1. Measure Cook Inlet temperature and salinity from which the density-driven, geostrophic circulation within the inlet can be derived.
2. Concurrently deploy drift cards whose deployment locations will be used as input to the CIRCAC numerical spill trajectory model for simulations of point source spills and whose recovery locations will then be compared to the grounding locations of the simulated spills.
3. Involve local high school science classes in the reparation, field work/data acquisition and data analyses.

Methods

1. Schedule spring and late summer sampling periods to correspond to period of increasing and diminishing fresh water runoff into Cook Inlet.

2. CTD casts at 1-2 nautical mile spacing along ~20-40 km offshore transects near participating high schools.
3. Take additional CTD cast along the transect on each side of visible fronts.
4. Plot cross sections and surface maps of the temperature, salinity, density, and geostrophic velocity (dynamic topography) fields after the spring, summer and fall hydrographic surveys.

Importance to MMS

Information will be used for Environmental Assessments for Cook Inlet Oil and Gas Lease Sales scheduled for 2004 and 2006

Date Information Required: For pos-lease NEPA documentation for Cook Inlet Lease Sales scheduled for 2004 and 2006 and DPP's.

Revised date: September 2003

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2004

Region: Alaska

Planning Areas: All Alaska Planning Areas

Type: Contract

Title: Revision of the OCS Oil-Weathering Model: Phases II and III

Actual Costs (in thousands):

Period of Performance: FY 1999-2004

FY1999 \$399

Total Cost: \$399

Conducting Organization: SINTEF Applied Chemistry

Description:

Background This study follows the recommendations made in the recently completed study “Revision of the OCS Oil-Weathering Model: Evaluation.” The OCS Oil-Weathering Model (OWM) had been used as a major analytical tool in every Alaska OCS EIS since the model was developed in 1983. The algorithms used in the model date from the late 1970’s and early 1980’s. The primary findings from the SINTEF study were that the existing MMS model was difficult to use because of antiquated code, that it was likely to produce erroneous results for many types of crude oil, and that its algorithms needed to be updated or replaced with ones that incorporated the past two decade and a half of oil spill research. The primary recommendation was that rather than updating algorithms and code in the MMS model, MMS would find it more cost-effective for MMS to buy into an existing state-of-the-art OWM.

Objectives The objectives of this study are to obtain an existing state-of-the-art OWM for MMS use and to upgrade the model to meet MMS needs.

Methods

1. Obtain existing state-of-art OWM.
2. Modify/improve the new OWM to meet MMS needs in environmental assessment and contingency plan review.
3. Add oils of concern to MMS to the OWM oil library.
4. Promote development of an experimental oil spill database that allows validation of model algorithms in various models against real data.

5. Provide Windows 95/NT, PC-based OWM code, any necessary software to run the model, users' manual.
6. Hold 1-day workshop to demonstrate model and provide user training.

Importance to MMS Oil-spill fate and behavior cannot be derived fully from the MMS OSRA and depend on use of the Oil-Spill Weathering Model. The model provides EIS analysts with a common, quantitative set of spill scenarios. The rate of oil dispersion into the water column calculated by the model is used to estimate whether State and Federal water-quality standards and criteria would be exceeded by a spill, over what area, and for how long. The weathering model calculates the area covered by a spill, an important parameter for estimating effects; but the OSRA does not. The model calculates the persistence of the lighter, but most toxic, components of the oil slick. This calculation allows analysts to directly estimate persistence of toxicity, rather than assume, as in the OSRA, that these toxic components persist over the first 3 days of a spill. Because the size of a spill affects its weathering, the model helps distinguish between effects of larger and smaller ">1,000-bbl" spills, e.g., between the effects of an average tanker spill versus an average pipeline spill. The in situ viscosity and degree of emulsification provided by the model are used in assessing the mitigation by and effectiveness of oil-spill countermeasures such as mechanical recovery, dispersant, and in situ burning. The model is similarly used by industry and MMS for oil-spill-contingency planning and has been run for the Regional Response Team in real-time response to spills such as the *Exxon Valdez* spill.

Date Information Required: For post-lease NEPA documentation for Beaufort Sea Lease Sales in 2003, 2005, and 2007 and in reviewing oil-spill-contingency plans for OCS and coastal facilities.

Revised date: September 2003

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2004

Region: Alaska
Planning Areas: Beaufort Sea, Chukchi Sea, Hope Basin
Type: Cooperative Agreement with CMI
Title: A Nowcast/Forecast Model for the Beaufort Sea Ice-Ocean-Oil Spill System (NFM-BSIOS)

Actual Cost (in thousands): **Period of Performance:** FY 2000-2004
FY 2000 \$407
Total Cost \$407

Conducting Organization: CMI, UAF

Description:

Background This study will build on the recommendations and results from multi-year simulations of Arctic circulation in an FY 1996-2000 study, recently completed CMI Arctic 2-D and 1.5-D modeling experiments, and additional Chukchi and Beaufort Sea circulation data derived from ongoing CMI and international Arctic oceanographic studies. The current models do not resolve the coastal barrier islands in the Beaufort Sea, where oil development is occurring.

Objectives The objective of this study is to obtain a finer resolution model to simulate circulation in the nearshore Beaufort Sea, with emphasis on the coastal waters <40 m deep between Harrison Bay and Camden Bay. The model will be designed to provide the information needed to run the MMS oil spill trajectory model and will also provide surface circulation fields that can be used to drive the MMS COZOIL model.

Methods

1. Nest the Princeton Ocean Model coupled with a Hibler-based ice model in a larger circulation ice-ocean model (CIOM), a 3-dimensional (wind, ice, ocean) model.
2. Feed the information to this finer grid model.
3. Provide the option of blending observational data into the model—particularly recent circulation, winds, and finer-scale ice data.
4. Provide simulated wind, current, and ice velocity fields on tape.

Importance to MMS The Circulation and Oil-Spill-Trajectory Model is a cornerstone to regional EIS's, environmental assessments, and oil-spill-contingency planning. Oil-spill issues involving

or resolvable by the trajectory model constitute half the public comments submitted on EIS's on proposed offshore oil and gas sales in the Alaska OCS Region. The MMS is currently using an Arctic basin model with 20-km grid spacing to project oil spill trajectories within 10-km of land for ongoing developmental Environmental Impact Statements. The model does not include the barrier islands even though the developments lie within the barrier islands. Model results are used to evaluate the risks and advantages of specific alternatives, and they are used to fine-tune protective lease-sale stipulations. The oil industry and MMS use the model results in preparation and review of postlease oil-spill-contingency plans. The Department of State used the model results to evaluate foreign policy implications of OCS activities. The U.S. Coast Guard uses model results in analysis of local, national, and international oil-transportation and spill-response issues. The Canadian and Alaskan oil industry and spill cooperatives have adapted portions of MMS circulation and trajectory models for their own application, including the placement of spill-response equipment. From the viewpoint of public and other governmental perceptions, it is critical to continue efforts to improve the art and reliability of circulation and trajectory models used in nearshore portion of the central Beaufort Sea.

Date Information Required: Information from this study will be used in preparing for post-lease NEPA documentation for Beaufort Sea Lease Sales in 2003, 2005, and 2007 and in reviewing oil-spill-contingency plans for OCS and coastal facilities.

Revised date: September 2003

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2004

Region: Alaska
Planning Areas: Beaufort Sea, Cook Inlet
Type: Cooperative Agreement with CMI
Title: Kinetics and Mechanisms of Slow PAH Desorption from Lower Cook Inlet and Beaufort Sea Sediments

Actual Costs (in thousands): **Period of Performance:** FY 2000-2004
FY 1999 \$59
Total Cost: \$59

Conducting Organization: CMI, UAF

Description:

Background Adsorption to sediment particles is a key process in determining the transport and fate of polycyclic aromatic hydrocarbons (PAH) in the marine environment. Previous CMI-funded studies of lower Cook Inlet sediments have shown that a substantial part of PAH adsorption is not rapidly reversible. Further study is needed to develop the ability to predict how adsorption and desorption would affect the longer term persistence (and toxicity) of PAH contamination in Alaska marine sediments. Recent *Exxon Valdez* studies have shown that the residual PAH concentrations in contaminated sediments are more toxic at much lower concentrations than previously estimated.

Objectives The objectives of this study are to test the hypotheses:

1. PAH adsorption found apparently irreversible in earlier CMI experiments is reversible with longer reaction times or greater water-to-particle ratios.
2. Interactions of PAH with sediment organic matter are responsible for adsorption that appears to be irreversible.
3. The properties of sediment organic matter govern adsorption and desorption of PAH by marine sediments.

Methods Phenanthrene will be used as a test PAH. Adsorption and desorption of phenanthrene will be measured using radio-labeled phenanthrene at multiple phenanthrene concentrations over adsorption times up to 60 days. Desorption experiments will be followed for up to 180 days or until desorption reaches steady state. Sediments used will include characterized subsamples from CMI studies in nearshore Beaufort Sea and lower Cook Inlet. Coal samples from Cook Inlet are also being used as a substrate.

Importance to MMS The study will lead to better predictive capability for the environmental fate of PAH, based on effects of sediment organic matter sources and composition on desorption. Understanding differences in sorption between Cook Inlet sediments and Beaufort Sea sediments will help MMS analysts make use of information from both planning areas in EIS's and EA's.

Date Information Required: The information will be used for post-lease NEPA documentation for Beaufort Sea Lease Sales in 2003, 2005, and 2007 and for Cook Inlet Lease Sales in 2004 and 2006, and DPP's.

Revised date: September 2003

Region: Alaska
Planning Area: Beaufort Sea
Type: Cooperative Agreement with CMI
Title: Petroleum Hydrocarbon Degrading Communities in Beaufort Sea Sediments

Actual Costs (in thousands):

Period of Performance: FY 1999-2004

FY 1999 \$50
FY 2000 \$31
FY 2001 \$67
Total Cost: \$148

Conducting Organization: CMI, UAF

Description:

Background High latitude marine oil spills have demonstrated that the composition of microbial communities affects rates of hydrocarbon degradation. Prior MMS research in the Beaufort Sea in the late 1970's and early 1980's indicated that indigenous microbes in this environment were poorly suited for rapid hydrocarbon destruction. Little research has been performed on Beaufort hydrocarbon degraders since then and little is known about whether sediment microbes have acclimated to hydrocarbon inputs in the last 20 years.

Objectives

1. Evaluate the current degree of microbial community acclimation to hydrocarbons from Barrow to the Prudhoe Bay/Northstar/Liberty area.
2. Evaluate the effects of fine-grained Beaufort Sea sediments on rates of community acclimation.
3. Evaluate how Beaufort Sea sediments might affect bioavailability of petroleum to communities of acclimated microbes.

Methods Surface sediments will be collected and the following measured:

1. Sediment microbial enumeration assays for populations of specific metabolic types.
2. Sediment macronutrient levels.
3. Most-probable number assays (MPN's) for crude oil emulsifiers and marine heterotrophs.

4. MPN's for specific substrates (e.g., PAH and alkane metabolizing populations).
5. Direct counts of sediment microbes.
6. Microbial activity from enumeration assays and radiocarbon-labeled hydrocarbon assays.
7. Gas chromatography analyses for petroleum hydrocarbon in samples with higher microbial numbers/activity.

Importance to MMS This study will be useful to MMS in possible cumulative effects monitoring of upcoming offshore development along the Beaufort Sea coast. The data from the study will be comparable to the earlier MMS pre-development studies.

Date Information Required: This information will be used for Beaufort Sea Lease Sales in 2003, 2005, and 2007, and DPP's.

Revised date: September 2003

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2004

Region: Alaska

Planning Areas: Beaufort Sea, Chukchi Sea, Hope Basin, Cook Inlet, and Gulf of Alaska

Type: Cooperative Agreement with CMI

Title: The Role of Zooplankton in the Distribution of Hydrocarbons

Actual Costs (in thousands):

Period of Performance: FY 1999-2004

FY1999 \$20

Total Cost: \$20

Conducting Organization: CMI, UAF; University of Alaska Juneau, Oil Spill Recovery Institute; and NOAA

Description:

Background Copepods play an important role in carbon flux in marine ecosystems. Vertical transport of carbon from the euphotic surface water to the benthos occurs when copepods feed on diatoms and incorporate them into larger, negatively buoyant fecal pellets. Therefore, analysis of hydrocarbon content of fecal pellets would provide insights in understanding the role of copepods in distribution and remediation of hydrocarbons. Data derived from analysis of copepod fecal pellets will provide baseline information for experimentation and modeling of ecosystem processes, which include accumulation of hydrocarbons in higher trophic levels such as commercial fish species.

Objectives The objectives of this study are to evaluate the role of copepods in the distribution and bioremediation of hydrocarbons in the environment. Specifically, this study will evaluate:

1. The composition and seasonal variation of lipids in forage plankton in Prince William Sound.
2. The relationships between lipid content and lipid composition in forage plankton and patterns of accumulation of hydrocarbons in copepod body tissue.
3. The role of the copepods *Neocalanus* spp. and *Pseudocalanus* spp. in the distribution of mineral hydrocarbons in the environment.

Methods A series of experiments will be conducted at Auke Bay Lab (ABL), in Southeast Alaska:

1. Collect copepods from Prince William Sound and Lynn Canal, near Auke Bay.
2. Collect zooplankton weekly from Lynn Canal, during April – August 2000, using vertical tows of a bongo net.

3. Place the subject species in incubators and exposed to sublethal concentrations of hydrocarbons (~10 ppm) for 96 hrs. At the end of the experiment, collect copepods and their fecal pellets and take to ABL for analysis of lipids and hydrocarbons using standard operating procedures developed by the Lab.
4. To evaluate the influence of oil exposure on egg production, sort experimentally dosed female copepods alive into individual containers, and conduct egg production experiments every 2 weeks.
5. Concomitant with live sampling for experimental animals, collect a sample for lipid analysis and immediately freeze for later analysis at ABL. For evaluation of differences in hydrocarbon uptake due to amount of surface area, collect measurements of length, wet weight, and dry weight of zooplankton from a random sample as often as experiments are conducted.

Importance to MMS This experimental study provides valuable information at the level of primary consumers about processes that affect the transference of hydrocarbons through the food chain and water column. It specifically supports the environmental assessment process for potential lease sales in Cook Inlet and, in general, supports assessments for potential developments in northern latitudes.

Date Information Required: This information supports post-lease NEPA documentation for Cook Inlet Lease Sales in 2004 and 2006, and DPP's.

Revised date: September 2003

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2004

Region: Alaska

Planning Areas: Beaufort Sea, Cook Inlet

Type: Competitive

Title: Persistence of Crude Oil Spills on Open Water

Actual Costs (in thousands):

FY 2003 \$120

Total Cost: \$120

Period of Performance: FY 2003-2004

Conducting Organization: S. L. Ross

Description:

Background The MMS typically evaluates a range of time periods such as 1, 3, 10, and 30 days to analyze the effects of open water oil spills in EIS's and EA's. The MMS uses these time periods for the oil spill trajectory analysis. State-of-the-art oil weathering models such as those currently used by MMS and NOAA only address initial weathering, the evaporation and vertical dispersion, and are not useful to determine the end point for trajectory modeling of oil spills on open water. Only for the lightest crude oils are evaporation and dispersion going to be useful for determining the persistence of crude oil on open water. For heavier oils, these models essentially project that even a one-cup spill would create a permanent slick (which may continue to expand). None of these models track slick integrity. Nor do databases for existing weathering models and other databases maintained by MMS and others compile the necessary spill information as to when slicks visibly dissipate as function of time or spill size.

Objectives The objective of this study is to collate and analyze historical data on the persistence of crude oil on open water primarily in relation to spill size. Additional factors that relate the persistence of crude oil on open water will be identified and analyzed. For example, the persistence of the *Exxon Valdez* crude in Prince William Sound after the first few weeks was due to re-oiling from oil stranded on surrounding shoreline rather than from the initial spillage. This study will provide historical validation for determining the persistence of crude oil spills *on open water* for setting end points for future trajectory modeling of various sizes of crude oil spills.

Methods

1. Identify the information about crude oil spills of at least 500 barrels necessary to collect to analyze the persistence of crude oil as an oil slick on the open ocean.
2. Conduct an extensive literature survey and or database survey from USDO, MMS, USDOC, NOAA, and USCG reports, Marine Pollution Bulletin, Oil Spill Intelligence Report and other relevant sources to gather information identified in (1).
3. Synthesize collected data from (1) and (2) into a Technical Information Management System (TIMS) compatible format (Access or Excel).

4. Conduct predictive (statistical) analysis of persistence crude oil spills relative to size and other factors for setting generalized end points for trajectory modeling.

Importance to MMS This information will provide historical validation to determine the most appropriate time periods for oil spill trajectory modeling given an assumed spill size. This information is relevant to all Lease Sale and Development EIS's and EA's.

Date Information Required: This study will start in FY 2002 to support future enhancement of circulation models and review of future oil-spill contingency plans. The information will also be used for Cook Inlet and Beaufort Sea Lease Sales and development EIS's.

Revised date: September 2002

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2004

Region: Alaska
Planning Areas: Beaufort and Chukchi Seas
Type: Competitive
Title: Statistical Approach to Alternative Oil Spill Occurrence Estimators for the Beaufort/Chukchi Sea OCS

Estimated Costs (in thousands): **Period of Performance:** FY 2000-2002
FY 2000 \$200
Total Cost: \$200

Contractor: Ted Eschenbach

Description:

Background The U.S. Outer Continental Shelf (OCS) historical platform and pipeline crude oil spills are mostly from the Gulf of Mexico and Pacific OCS. This spill record does not include pipeline spills inshore of the OCS, in State waters or on land. The MMS Alaska OCS Region intends to calculate spill occurrence based on Regional considerations, such as Alaska North Slope and Arctic Canada rather than on the Gulf of Mexico and Pacific OCS experience, and to include all major pipeline spills, both onshore and offshore, in environmental impact assessment. The first step in this process was a prior study (OCS Study MMS 2000-007) in FY 1999-2000 to collate available information on crude and diesel spills of at least 100 bbl from the oil industry in the Alaska North Slope and Arctic Canada, verify spill information for spills of at least 500 bbl, and to estimate provisional occurrence rates for use in the nearshore Beaufort Sea OCS. Based on this prior study, MMS was able to extrapolate pipeline and facility occurrence rates for spills of at least 500 bbl from onshore oil spill experience to shallow coastal waters in the nearshore Beaufort Sea. The MMS found too few spills of at least 1,000 bbl to directly calculate occurrence rates for this size category.

The MMS Technology and Assessment (TAR) Program is approaching pipeline spill risk from an engineering view with ongoing studies for nearshore Arctic pipelines and Gulf of Mexico. Nonproprietary products from these studies will be made available to this study as they become available.

Objectives

1. Apply statistical procedures to develop occurrence rates for oil spills of at least 1,000 bbl from historical crude and diesel spills compiled for the Alaska North Slope and the Trans-Alaska Pipeline from Prudhoe to Valdez, excluding the marine terminal.
2. Evaluate the applicability of results from objective (1) to offshore lease tracts where water

depths make gravel islands unlikely or infeasible.

3. Describe alternative approaches to estimating oil spill occurrence for Beaufort Sea and Chukchi Sea lease sales and development projects from spills of at least 1,000 bbl.
4. Develop appropriate occurrence estimators, choosing the best method from objective (3).
5. Provide professional support to MMS in regard to statistical issues of occurrence rates and estimator(s) related to this study and its results.

Methods

1. The spill data from the preliminary study and environmental exposure issues for the <200-m deep portion of Beaufort Sea Planning Area will be reviewed. The relevance of the spill data to areas in waters deeper than 20 m will be evaluated.
2. There are alternate approaches that can be used to estimate spill rates in the absence of sufficient historical data. Alternative oil-spill frequency estimators suitable for predictive use in Beaufort and Chukchi Sea OCS will be evaluated, both in exploration and development phases. Draft oil spill rates based on the most appropriate estimators will be provided. The study will also quantify robustness of the statistics (Confidence Limits on spill frequency estimates), and quantify precision/variance of estimates of spill probabilities.
3. Forty hours of on-call statistical/professional support to MMS staff regarding use of the results of (2) will be provided.

Importance to MMS The Oil-Spill-Risk Analysis (OSRA) is a cornerstone to regional EIS's, environmental assessments, and oil-spill-contingency planning. Oil-spill issues constitute a significant portion of public comments submitted on sale or development EIS's in the Alaska OCS Region.

Date Information Required: Information from this study will be used for post-lease NEPA documentation for Beaufort Sea Lease Sales in 2003, 2005, and 2007, DPP's, and review of oil-spill-contingency plans for OCS and coastal facilities.

Revised date: September 2003

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2004

Region: Alaska
Planning Area: Beaufort Sea
Type: Cooperative Agreement with CMI
Title: Trace Metals and Hydrocarbons in Sediments of Beaufort Lagoon, Northeast Arctic Alaska

Actual Costs (in thousands): **Period of Performance:** FY 2003-2005
FY 2003 \$167
Total Cost: \$167

Conducting Organization: CMI, UAF

Description:

Background For comparison to OCS development areas, it is important to establish measurements of trace metals and hydrocarbons in sediments of Beaufort Lagoon, located at the eastern margin of the Alaskan Beaufort Sea. The lagoon sediments of the North Slope may be a sink for both organic and inorganic anthropogenic compounds. Sediments may serve as transfer pathways to higher trophic levels. Environmental accumulation is of particular concern in the Arctic where marine organisms, being lipid rich, with relatively simple and short food chains and low biodiversity, may be especially vulnerable to bioaccumulations.

Objectives The primary objective of this study is to estimate the concentrations of 12 metals (V, Cr, Cu, Ni, Zn, As, Cd, Pb, Sn, Ba, Fe and Mn) in the mud fractions (<63 μ m size) and HG and hydrocarbons in gross sediments of the Beaufort Lagoon that are known to have been exposed to: a) long-term natural oil seepage; b) anthropogenic activities with refined petroleum products input; and c) pristine conditions. This objective will help to develop criteria for detecting metal and hydrocarbon accumulation resulting from marine and other human activities in the Beaufort Lagoon region as well as elsewhere in the Alaskan Beaufort Sea.

Methods

1. Use a vanVeen grab sampler to collect sediment samples from the Beaufort Lagoon at 20 selected stations spread over three location types, areas of natural oil seepages, recent impact from human activities, and little or no human impacts.
2. Split samples into 3 sub samples for a) trace metal in mud fraction; b) granulometric and mercury analyses; and c) hydrocarbon analysis.
3. Using statistical analysis, assess the relative abundance of the natural oil seep, refined petroleum, fresh crude oil and natural terrestrial or marine biogenic hydrocarbons in the samples.

4. Examine differences between these samples and North Slope samples from an industrialized (Prudhoe Bay/Colville River) and an urbanized (Elson Lagoon near Barrow) region.

Importance to MMS This study will increase a baseline of existing sediment conditions along the Alaskan Beaufort Sea for monitoring potential effects of offshore oil and gas activities. The study will provide information for analyzing the existing conditions in prelease, exploration, and development-related NEPA documents. Findings will increase knowledge of the mechanisms of environmental change.

Date Information Required: Study results will be used for post-lease NEPA documentation for the proposed Beaufort Sea Lease Sales in 2003, 2005 and 2007. The data will also be useful in evaluating development plans being submitted for the Beaufort Sea.

Submitted by: Alaska OCS Region

Updated: September, 2003

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2004

Region: Alaska
Planning Areas: Beaufort and Chukchi Seas and Cook Inlet and Gulf of Alaska
Type: Cooperative Agreement with CMI
Title: Seabird Samples as Resources for Marine Environmental Assessment

Actual Costs (in thousands): **Period of Performance:** FY 1999-2004
FY 1999 \$71
Total Cost: \$71

Conducting Organization: CMI, UAF

Description:

Background The birds of Alaska that are dependent upon marine environments are part of a complex array of more than 100 species occupying three trophic levels. These birds are a major component of Alaska's marine ecosystems and may be vulnerable to both natural and anthropogenic changes, e.g., Outer Continental Shelf (OCS) activities. Many species provide an important source of food for humans, and more generally, are heavily used for a variety of subsistence purposes by Alaskan Natives. If analyses contrasting places or events are to be used to monitor the environment and biological systems, archival samples must be routinely preserved. Birds can be environmental indicators, and represent a useful model for such analyses.

Objective The objective of this study is to preserve high-quality samples from marine and coastal birds in Alaska for studies ranging from contaminants and stable isotopes to genetics and morphology.

Methods Samples from the Beaufort Sea and Cook Inlet will be given the highest priority. Collections will be made in connection with existing projects. Tissues and specimen data will be collected by a variety of participating scientists. Maximum use will be made of each individual bird, including when the quality of the specimen warrants it, the skin, skeleton, two tissue samples, and stomach contents. No chemical will be used in the preparation process, except when a specimen is particularly fatty. In such cases the fat remaining after fleshing the skin is often removed with a solvent (e.g., mineral spirits). Skin and skeleton preparations will be archival in quality, and are expected to last at least 300-400 years, given current information. Tissue samples will be archived in two, 2 ml plastic cryovials and stored at -80 degrees C in the Alaska Frozen Tissue Collection (AFTC). Information on samples that are available to researchers for scientific study will be detailed in a web-site database.

Importance to MMS This study supports a source of bird tissues for use by scientists and other parties conducting studies of possible industrial pollutants. This will permit enhanced postlease

monitoring in the Beaufort Sea and Cook Inlet. This project is needed to support monitoring for past, ongoing, and upcoming OCS activities on the Beaufort Sea and Chukchi Sea, Cook Inlet and Gulf of Alaska. Data products and annual reports will provide critical and timely inputs to the EIS's and EA's. The study also will develop information useful to enhancement of outreach efforts with local constituencies.

Date Information Required: For post-lease NEPA documentation for Beaufort Sea Lease Sales in 2003, 2005, and 2007, Cook Inlet Lease Sales in 2004 and 2006, and DPP's.

Revised date: September 2003

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2004

Region: Alaska

Planning Areas: Beaufort Sea

Type: USGS Biological Resources Division

Title: Modeling Recovery Rates for Avian Populations

Estimated Costs (in thousands):

Period of Performance: FY 2001-2004

FY 2001 \$125 (BRD)

FY 2002 \$125 (BRD)

Total Cost: \$250 (BRD)

Conducting Organization: USGS Biological Resources Division

Description:

Background At least ten avian species, principally loons, waterfowl and shorebirds are found in the Beaufort Sea region and may be at potential risk of effects of oil and gas development on the Alaska OCS. Several species are listed under the Endangered Species Act (ESA) or have experienced unusual declines in recent decades. MMS documents have included estimates of the time needed for vulnerable avian populations to recover to their original level following an oil spill or other mortality event, but such estimates often are relatively subjective. It is important that MMS use statistically improved estimates of the potential for population recovery from possible mortality events. Species with highest priority for model development would be spectacled eider (model available), oldsquaw, common eider, king eider, yellow-billed loon, brant (model forthcoming), Steller's eider, Pacific and red-throated loons, and red-necked phalarope. Lower priority species in areas where oil and gas development may occur in the future include common and thick-billed murres, black-legged kittiwake, marbled murrelet, and wintering Steller's eiders. Data for various demographic parameters for some species currently need to be supplemented

Objectives The goal of this study is to hold a workshop in order to facilitate the development of a computer model, or models, which will estimate the time required for populations of avian species occupying the Alaska OCS to recover from certain levels of mortality caused by contact with an oil spill, or other perturbation. This effort would require accomplishing the following objectives:

1. Develop a model, or if necessary models, incorporating all variables and parameters required to yield realistic and accurate estimates of the time needed for each population experiencing various one-time mortality losses to recover to its initial level.

2. Develop the model(s) into a stand-alone interactive program with the capability to generate recovery rates associated with user-specified values for variables and parameters.

Methods A spectacled eider model of the type required by MMS has been developed recently; this can provide a basis for modeling other seabirds, and together with other existing models, it can be a starting point for modeling other species groups. Values necessary to model recovery rates for these species will require using appropriate values for such parameters taken from the literature. The Beaufort Sea Waterfowl monitoring study funded by MMS beginning in summer 1999 is expected to fill in some of the data gaps for oldsquaw and eiders. The recovery model, or models, will be produced during a workshop entitled: "Beaufort Waterfowl Recovery Modeling Workshop." Workshop participants will be of limited number, consisting mostly of experienced population modelers selected from all sectors, including governmental, academic and private. All available data for use in recovery modeling would be obtained, formatted and provided to participants well in advance of the workshop.

Importance to MMS The MMS analyses will benefit substantially from the addition of more accurate determinations of recovery rates following assumed losses from populations of species for which there is concern over the status and trend, or those listed under ESA. Information provided in this study would respond to concerns expressed by FWS and environmental organization reviews of Northstar and NPR-A.

Date Information Required: For post-lease NEPA documentation for Beaufort Sea Lease Sales in 2003, 2005, and 2007, and DPP's.

Revised date: September 2003

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2004

Region: Alaska
Planning Areas: All Alaska Planning Areas
Type: USGS Biological Resources Division
Title: Alaskan Marine Mammal Tissues Archival Project

Actual Costs (in thousands):	Period of Performance: FY 1999-2004
FY1999 \$88(BRD)	
FY2000 \$88(BRD)	
FY2001 \$88(BRD)	
FY2002 \$88(BRD)	
FY2003 \$88(BRD)	
Total Cost: \$444(BRD)	

Conducting Organization: USGS Biological Resources Division

Description:

Background Scientists, environmental groups and Alaska Natives are concerned about possible effects on marine mammals from OCS-related discharges. The collection of marine mammal tissues over a period of years allows for monitoring potential effects and future comparisons with hydrocarbon levels in specimens associated with oil spills or in the vicinity of drilling operations. Since adding a part-time USGS-BRD Biological Technician to the Project, the number of samples collected has increased. The project also has linkages with NOAA, a lead agency for Arctic Environmental Protection Strategy (AEPS) and Arctic Monitoring and Assessment Program. Tissues collected have come from Barrow, Point Lay, Point Hope, Nome, St. Paul Island, English Bay, Cook Inlet, Prince William Sound, the Aleutian Islands, St. Lawrence Island, and Round Island. Marine mammal species sampled include ringed seals, bearded seals, beluga whales, bowhead whales, spotted seals, harbor seals, northern sea-lions, northern fur seals, Pacific walrus, and polar bears. Aliquots have been analyzed from a representative number of these samples.

Objectives

1. Collect tissues from Alaskan marine mammals for long-term cryogenic archival.
2. Estimate and continue to monitor levels of certain metals, polycyclic aromatic hydrocarbons (PAH's), and chemical compounds associated with the oil and gas industry in marine mammals, with special emphasis on those species used as subsistence resources.
3. Monitor the condition of archived samples over time.

4. Enhance availability of marine mammal tissue data for use via a web-linked relational database.
5. Demonstrate menu-driven internet website for user-friendly access by agency managers, scientists, subsistence villagers, and other users.

Methods Tissues are collected under sterile conditions using titanium knife blades then stored at the temperature of liquid nitrogen. Because only fresh specimens are considered suitable for the rigorous analysis protocol, the collection of marine mammal tissues is fully coordinated with Alaskan village subsistence hunters, who participate directly in the project. Native villages provide various forms of assistance to the tissue archival program, including participation in the tissue-collection and cryogenic-storage process. Information technology specialists will design and implement an enhanced AMTAPP website.

Importance to MMS The study provides additional monitoring data in geographic areas of interest to the gas and oil industry. Tissues collected in the Beaufort Sea will continue to help monitor postlease activities pursuant to offshore drilling operations for Lease Sales 71, 124, 144, and 170. Continuity of funding for this study is considered important to maintain previously collected tissues in cryonic storage.

Date Information Required: This continuation study is needed to support monitoring for past, ongoing, and upcoming OCS activity in Alaska planning areas. Data products and annual reports will provide critical and timely inputs to EIS's and EA's. The study will also develop information access that addresses public concerns raised during outreach efforts.

Revised date: September 2003

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2004

Region: Alaska
Planning Area: Beaufort
Type: Cooperative Agreement with CMI/BRD
Title: Use of the Beaufort Sea by King Eiders

Actual Costs (in thousands):	Period of Performance: FY 2002-2007
FY 2002 \$320	
FY 2003 \$0	
FY 2004 \$400	
FY 2005 \$350	
FY 2006 \$350	
FY 2007 \$100	
Total Cost: \$1,520	

Conducting Organization: CMI, UAF

Description:

Background The king eider population appeared to remain stable between 1953 and 1976. However a recent analysis of migration counts off Point Barrow, Alaska estimated that king eiders have declined 56% (3.9% per year) from approximately 802,556 birds in 1976 to about 350,835 in 1996 (Suydam et al. 2000). King eiders migrate eastward along the Beaufort Sea during May-June to arctic nesting areas in Alaska and Canada. During molt-migrations in late summer and fall-migration (September-August), eiders move westward along the Beaufort Sea coast to overwintering areas in the Chukchi and Bering Seas. Although migration count data have been collected at Point Barrow intermittently since 1953, little information exists regarding the importance of the Beaufort Sea to king eiders in other locations. Petroleum related exploration and development has the potential to affect king eider populations. For example, the vulnerability of king eiders to an offshore oil spill was verified when at least $1,609 \pm 70$ king eider carcasses were found on St. Paul Island following an oil spill February 1996. Other effects could result from disturbance of resting or migrating flocks and death of individual birds due to strikes on offshore structures. The first oil development in the Beaufort Sea (BPXA Northstar) started production in November 2001 and other developments are likely. Additional information on patterns of migration and habitat use for king eiders in the Beaufort Sea would be useful for predicting the potential impact of petroleum related developments along the Beaufort Sea coastline.

Objectives

1. Document movements and locations of spring, summer and fall migrating adult female king eiders (successful and unsuccessful breeders) marked on breeding areas along the Beaufort Sea Coastline, including Kuparak and NPR-A.
2. Document habitat use and breeding success of females nesting at Kuparak and NPR-A study sites.
3. Describe potential staging and over-wintering areas used during spring and fall migration.
4. Evaluate whether adult female king eiders (emphasis on successful breeders) molt in the Beaufort Sea prior to fall migration to over-wintering areas.
5. Test an extended life, implantable satellite transmitter that uses batteries developed for implantation in human applications; evaluate the potential for development of TDR (time-depth recorder) technology for use on king eiders; test TDR technology if feasible.

Methods This study is envisioned as a jointly funded activity conducted by the University of Alaska Fish and Wildlife Cooperative Research Unit with key organizations potentially including: MMS, University of Alaska CMI, North Slope Borough, U.S. Fish and Wildlife Service, and Canadian Wildlife Service. The study will use implanted satellite transmitters to evaluate habitat use patterns and locate the migration corridor for king eiders. Female king eiders (60 successful breeders and 60 unsuccessful breeders) and male king eiders (n = 60) will be instrumented with implanted satellite transmitters on their breeding grounds and monitored during periods when they undertake spring and fall migrations. Satellite transmitters will also allow the opportunity to document the rates of migration across Beaufort Sea. Develop and test an extended life, implantable satellite transmitter, and if feasible, TDR technology for use on king eiders.

Importance to MMS Because basic biological parameters (i.e., population status, survival estimates, migration routes, and habitat requirements) for king eiders in the Beaufort Sea have been poorly described, assessment of potential impacts of offshore oil development are limited in regard to protecting the species. Increased knowledge of this species could be incorporated with data being collected by the U.S. Fish and Wildlife Service and the Canadian Wildlife Service to better assess impacts.

Date Information Required: For post-lease NEPA documentation for Beaufort Sea Lease Sales in 2003, 2005, and 2007, and DPP's.

Revised date: September 2003

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2004

Region: Alaska
Planning Areas: Beaufort Sea
Type: Cooperative Agreement with CMI
Title: Role of Grazers on the Recolonization of Hard-Bottom Communities in the Alaskan Beaufort

Actual Costs (in thousands): **Period of Performance:** FY 2002-2005
FY 2002 \$249
Total Cost: \$249

Conducting Organization: CMI, UAF

Description:

Background In 1971, a diverse kelp and invertebrate community was discovered near Prudhoe Bay in Stefansson Sound, Alaska. This area has been named the Boulder Patch by the U. S. Board of Geographic Names. The Boulder Patch contains large numbers of cobbles and boulders that provide a substrate for attachment for a diverse assortment of invertebrates and several species of red and brown algae. The invertebrate assemblage that lives on the rocks and within the kelp beds has representatives from every major taxonomic phylum (Dunton 1985). The predominant algae is brown, *Laminaria solidungula*, which constitutes 90% of the brown algal biomass. This alga is an important food source to many benthic and epibenthic organisms. Differences in infaunal abundance and biomass between the Boulder Patch and peripheral sediment areas demonstrate the importance of this unique habitat. In the Boulder Patch, algae and epilithic invertebrates cover nearly all exposed substrate, with the exception of recently upturned rocks (Dunton and Schonberg 2000).

The Boulder Patch is potentially vulnerable to disturbance by oil and gas related activities. Construction of artificial islands and related trenching for construction of buried pipelines, such as is the case for the Northstar and proposed Liberty developments, can cause destruction of flora and fauna due to mechanical disturbance or sedimentation during construction. Other factors such as pollution could also have a detrimental effect. Recolonization experiments in the Boulder Patch have shown that recovery of denuded areas is slow, and one of the primary reasons for this may be grazing by invertebrates (Dunton, et al. 1982). This study will employ various comparisons using exclusion cages, cage controls and natural rock to assess the effect of grazing/predation on the rate of recovery of disturbed substrates in the Boulder Patch.

Objective Evaluate whether grazing is limiting the rate of recruitment of hard substrate communities in the Boulder Patch.

Methods

1. The study will be conducted at Dive Site 11 (DS-11) in Stefansson Sound, Alaska (Dunton 1985) by teams of SCUBA divers.
2. Simple manipulations will be conducted to compare bare rock to bare rocks with exclusion cages. Necessary controls will be employed to evaluate factors such as light intensity and sedimentation.
3. Repeated measures analysis of variance will be used to analyze data collected for each group of organisms studied (red algae, brown algae, hydroids, bryozoans, tubeworms, and total cover).

Importance to MMS This research is expected to lead to a better understanding of marine environments affected or potentially affected by OCS oil and gas exploration and development. Experimental studies to be conducted by the investigator could lead to a better understanding of natural environmental processes and possible influences of OCS activities.

Date Information Required: For post-lease NEPA documentation for Beaufort Sea Lease Sales in 2003, 2005, and 2007, and DPP's.

Revised date: September 2003

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2004

Region: Alaska

Planning Areas: Beaufort Sea, Chukchi Sea,

Type: Cooperative Agreement with CMI

Title: Susceptibility of Sea Ice Biota to Disturbance in the Shallow Beaufort Sea. Phase 1: Biological Coupling of Sea Ice with the Pelagic and Benthic Realms

Actual Costs (in thousands): **Period of Performance:** FY 2002-2004
FY 2002 \$193
Total Cost: \$193

Conducting Organization: CMI, UAF

Description:

Background Sea Ice is a key component in structuring polar environments. Beside its important role as a platform for marine mammals and birds, it serves as a habitat for a unique highly specialized community of bacteria, algae, protozoa and metazoan which contribute to the biogeochemical cycles of the Arctic and Antarctic seas. Early seal hunters had already discovered the close relation between ice algae production and higher trophic levels when they found numerous seals associated with brownish-colored ice floes which they named seal-ice. This coloration is caused by billions of unicellular algae living within the sea ice. The ice algal primary production in seasonally ice-covered waters contributed 4-26% to total primary production and may contribute above 50% in the permanently ice-covered central Arctic. The enormous sediment load of so-called 'dirty ice' is assumed to have a profound impact on the ice biota but this impact has not been quantified yet. The only available estimate of annual ice algal primary production for the shallow Beaufort Sea report 5g Cm⁻². The general scarcity of ice algae biomass data highlights the need for comparative and supplementary new data on ice algal biomass in the Beaufort Sea.

Sea ice algae not only contribute significantly to the overall primary production of the Arctic, but also form the basis for the sea-ice related food web which extends to higher trophic levels such as sea floor dwellers, seals, and polar bears. Previous studies in the shallow coastal Beaufort Sea suggest that larvae of benthic copepods, polychaetes and gastropods use sea ice as a nursery ground whereas the adults of these taxa inhabit the benthos. Disturbance of the sea ice habitat, e.g. by enhanced sediment load, construction of ice roads, and gas or oil spills, would likely impact the biological links between the ice, water column and sea floor.

Objectives Evaluate whether:

1. Sea ice biota contributes significantly to the biogeochemical cycle in the fast-ice covered shallow Beaufort Sea in terms of primary and secondary production and also as a seasonal habitat and food source for pelagic and benthic invertebrates.
2. Certain life stages of a number of benthic taxa depend on the ice algal biomass as a food source early in the year prior to the occurrence of phytoplankton blooms.
3. Disturbances of the linkages between sea ice, water column and benthos, e.g. by increased sediment load and changes in light availability, will reduce the abundance and survival of ice associated biota. This would affect the available amount of food to higher trophic levels such as fish, seals, and birds.
4. Abundance ratios of disturbance-sensitive to disturbance-insensitive taxa in sea ice can be used as a measure of pollution/disturbance of the area.

Methods

1. Conduct sampling on the floating fast ice close to Barrow at a water depth of 5-10 meters in early winter, early spring and early summer to cover an entire seasonal sea ice cycle.
2. Select sites to represent clear ice and dirty ice sediment loads to compare the impact of light availability on the biological activity in the ice.
3. Collect fast ice samples with a 10 cm ice corer.
4. Analyze lowermost 10 cm in 10-1, 1-5 and 5-10 cm segments by melting, filtering, extraction with acetone, and reading in a fluorometer.
5. Estimate light intensity under the ice with a light sensor and data logger.
6. Use dry weight of a second core to calculate the total amount of particulate matter in the ice.
7. Fix a sub-sample of melt for determination of ice algal, meiofaunal, and macro-faunal abundances.
8. Sample phyto- and zooplankton with plankton nets at intermediate water depths.
9. Sample benthic macrofauna with Van-veen grab in four replicates.
10. Assess route of sea ice-produced particulate matter for the nutrition of sea ice meiofauna using isotopic signatures of zooplankton and zoobenthos.

Importance to MMS The information will be used by MMS to evaluate potential impacts from disturbances to the sediment by exploration and production of OCS resources. The information can help evaluate sensitive areas and appropriate mitigation measures.

Date Information Required: For post-lease NEPA documentation for Beaufort Sea Lease Sales in 2003, 2005, and 2007, and DPP's.

Revised date: September 2003

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2004

Region: Alaska
Planning Areas: Beaufort Sea
Type: Cooperative Agreement with CMI
Title: Foraging Ecology of Common Ravens (*Corvus corax*) on Alaska's Coastal Plain

Actual Costs (in thousands): **Period of Performance:** FY 2003-2006
FY 2003 \$205
Total Cost: \$205

Conducting Organization: CMI, UAF

Description:

Background The impact of avian predators, including the common raven, on the North Slope has been assumed to be higher in areas with oil development or human habitation due to increased availability of food and nest sites associated with human-made structures. Predator management on the Alaska North Slope is an issue that has arisen in many contexts. For example, the Steller's Eider Recovery Team has recommended killing ravens in Barrow to benefit the threatened Steller's eider (*Polysticta stelleri*), and this recommendation has been implemented to a limited extent. More generally, the U.S. Fish and Wildlife Service has attempted to reduce predator access to human food waste in the oilfields and villages through its authorities under the Clean Water Act.

It is clear that common ravens (*Corvus corax*) on the North Slope are utilizing anthropogenic factors both as nesting sites and to obtain sufficient food to overwinter on the outer arctic coastal plain. However, the associated impact of raven predation on other tundra-nesting birds has not been studied. Data on summer diet and raven productivity are needed to assess whether increased raven numbers pose a threat to other species, particularly the threatened spectacled (*Somateria fischeri*) and Steller's eiders.

Objectives The objective of this study is to document summer foraging ecology, and distribution and abundance of ravens nesting within areas of oil development, in and near villages, and in semi-natural habitat (DEW Line sites) on Alaska's North Slope.

Methods

1. Use biological surveys and obtain anecdotal information from local residents to document the distribution and abundance of ravens breeding in the oil fields, in and near villages, and in semi-natural sites using surveys and local knowledge. A GIS map will be produced showing the locations of nests and/or breeding pairs.

2. Document the summer diet of nestling ravens using video camera monitoring stations, by direct observation at nests, by examination of pellets and/or fecal remains, and by collection of prey remains at nests.
3. Monitor nests to assess fledging and nest success of ravens in and outside of the oil fields.
4. Use VHF and satellite telemetry to document the movements of ravens from nesting sites to foraging areas, and between breeding and non-breeding seasons on Alaska's North Slope.

Importance to MMS This study represents collaboration among MMS, the University of Alaska CMI, the North Slope Borough and Phillips Petroleum to address an issue that has been increasing in relevance to environmental assessment of potential effects of oil and gas development. MMS will possibly have to address mitigation needs in the event that structures, pipelines or other factors related to oil or gas development are shown to enhance certain predation. Information from this study will also be useful for analysis of the cumulative effects of offshore development on the fauna of the OCS and Alaskan Coastal Plain.

Date Information Required: For post-lease NEPA documentation for Beaufort Sea Lease Sales in 2003, 2005, and 2007, and DPP's.

Revised date: September 2003

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2004

Region: Alaska

Planning Areas: Beaufort Sea

Type: Competitive or Joint Funding

Title: Analysis of Variation in Abundance of Arctic Cisco in the Colville River

Actual costs (in thousands):

Period of Performance: FY 2003-2005

FY 2003: In Procurement, TBD

Description:

Background Native Alaskans are concerned that arctic cisco in the Colville River have been less abundant during the last few years than in the years preceding. Considerable research has been conducted on the natural history of the species, with particular emphasis being placed on the potential effect of causeways, constructed during oil development, on migration. The current understanding of the arctic cisco life cycle is that all spawning for the species takes place in the Mackenzie River drainages. The young-of-the-year leave the river during the spring and become entrained in wind-driven currents along the Beaufort coast. If east winds are sufficient and sustained, young fish migrate all the way to the Colville River, where they will spend several years maturing before returning to the MacKenzie River. If winds are not sufficient, they go elsewhere. Thus, migrations of arctic cisco are particularly vulnerable to large-scale changes in oceanic circulation, such as recent suspected changes in the Beaufort gyre, which may lead to modification of the strength and direction of nearshore winds. Nuiqsut villagers are also concerned that drilling muds, spilled underground during the construction of the Alpine pipeline, could be entering the river and have effects on the abundance of arctic cisco. Other factors that could affect arctic cisco populations include, but are not limited to, factors affecting recruitment at the MacKenzie River, changes in the channels of the Colville river and hence the distribution of fish available for subsistence use, fishing practices and harvest, and possibly, the cumulative effects of onshore and offshore oil-related development. A study is needed to further establish the observed trends in arctic cisco abundance and evaluate the factors influencing population variation.

Objectives

1. Access information from Native subsistence users, fisheries biologists and governmental organizations to develop hypotheses on the variable, or possible declining, arctic cisco abundance in the Colville River and its tributaries.
2. Quantify inter-annual variation in the abundance of arctic cisco in the Colville River and its tributaries.
3. Use a statistical approach to estimate which environmental factors contribute to observed variation in arctic cisco abundance in the Colville River.

Methods

Phase I:

Sponsor a meeting of individuals with traditional and scientific knowledge about arctic cisco abundance and fishing success, stock exploitation, long-term climate related changes, and arctic cisco genetics to identify factors that might contribute to observed variation in arctic cisco abundance and to recommend a study design for further scientific inquiry.

Phase II:

1. Quantify the abundance of fish of various cohorts in the Colville and its tributaries using sampling techniques such as fyke nets.
2. Use existing data, and data from concurrent MMS- and MMS/CMI-funded studies to analyze the effects of changes in oceanic circulation on nearshore wind and related fish migrations between MacKenzie River and Colville River.
3. Review existing data from the MacKenzie River to see if gross changes in arctic cisco stocks have occurred.

During Phase I, the Alaska Region will attempt to seek joint funding from potential co-sponsors, such as the State of Alaska or other Federal agencies with fisheries management responsibilities.

Importance to MMS MMS will use the products of this study to address OCSLA requirements, assist NEPA-document preparation, prepare mitigating measures, review oil-spill-contingency plans, facilitate outreach with North Slope communities regarding the MMS program, and review and formulate offshore policy for Alaska.

Date Information Required: For post-lease NEPA documentation for Beaufort Sea Lease Sales in 2003, 2005, and 2007, and DPP's.

Revised date: September 2003

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2004

Region: Alaska
Planning Areas: Beaufort Sea
Type: Competitive
Title: Locating Overwintering Fish Habitat, Colville River /Beaufort Sea
Actual Costs (in thousands): **Period of Performance:** FY 2003-2005
Total Costs: In Procurement, TBD

Description:

Background Very little documentation exists on actual overwintering habitat of Beaufort Sea amphidromous fish. Amphidromous fish such as char, cisco, whitefish and grayling depend almost exclusively on Beaufort Sea coastal waters for food. After a brief summer in food-rich coastal marine waters, the fish are believed to retreat to overwintering sites as Beaufort waters turn frigid and inhospitable in fall. Brackish deltas, deep pools, springs, and freshwater lakes are considered the primary overwintering habitats. Whether amphidromous fish overwinter in nearshore areas just outside the shorefast ice is unknown (Holland, pers. comm).

Overwintering sites are especially critical to some species because they must occupy these limited sites for two-thirds of the year. Just when inland waters become essential for overwintering they shrink by 98% due to reduced runoff and freezing. By late winter, even the largest rivers cease to flow and freeze to the bottom over long stretches. If the fish are forced to crowd into limited deepwater pockets, the waters could become overcrowded, anoxic, and may freeze. Once the connecting channels freeze solid, the fish would be isolated and unable into more hospitable habitat. Thus, in order to return to coastal environments for the short 2-3 month summer growth spurt, amphidromous fish must survive a minimum of eight months in these pockets, from fall freeze-up to spring breakup. If overwintering also occurs beyond the shorefast ice, then overwintering habitat may not be limiting.

Recently, remote sensing applications such as synthetic aperture radar (SAR) in conjunction with modeling have reduced the potential high cost of evaluating overwintering habitats. Developing methods using these techniques would increase our efficiency in identifying overwintering. A greater knowledge of overwintering sites is critical to protecting critical subsistence and biological resources while developing offshore oil and gas resources.

Objectives

1. Identify probable amphidromous overwintering habitats of the Beaufort Sea.
2. Test remote sensing applications for documenting overwintering habitat.
3. Document presence or absence of overwintering fish inland and beyond shore fast ice.

Methods

1. Identify suspected nearshore amphidromous overwintering sites in test and control areas from local knowledge, literature, and remote sensing data. Choose a river system believed to support extensive overwintering and another river system believed to support little overwintering as a control.
2. Use available remote sensing data such as SAR and SAT images, or existing data to estimate location and of amount amphidromous overwintering habitat.
3. Document actual use by remote under-ice photography, diving and/or sampling from onshore pipeline region to beyond shore fast.
4. Evaluate remote sensing tools to identify amphidromous overwintering and estimate cost of documentation across the Beaufort Sea.

Importance to MMS MMS is responsible for identifying and mitigating potential environmental effects of OCS development to biological and subsistence amphidromous fish resources. Amphidromous fish in limited inshore overwintering sites are particularly vulnerable to disturbance or reduction of habitat by human activities and developments onshore including pipelines, roads, water withdrawals for ice roads, and oil leaks and spills. Amphidromous fish overwintering beyond the shorefast ice would be more susceptible to off shore development activities such as ice roads, causeways, drilling and under ice oil spills. Presently, limited knowledge of actual overwintering sites hinders evaluation of these potential effects. Documenting overwintering sites is prohibitively expensive using present techniques. Information from this study will contribute to Beaufort Sea EIS's, EA's and mitigation measures in 2005, 2007.

Date Information Required: For post-lease NEPA documentation for Beaufort Sea Lease Sales in 2003, 2005, and 2007, and DPP's.

Revised date: September 2003

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2004

Region: Alaska
Planning Areas: Beaufort Sea, Chukchi Sea
Type: In-House Study/Interagency Agreement
Title: Monitoring the Distribution of Arctic Whales

Actual Costs (in thousands):	Period of Performance: FY 2002-2006
FY2002 \$350	
FY2003 \$350	
FY2004 \$325	
FY2005 \$325	
FY2006 \$325	
Total Cost: \$1,675	

Conducting Organization: MMS

Description:

Background The MMS has conducted aerial surveys of the fall migration of bowhead whales each year since 1987. Methods are comparable from year to year, based on similar monitoring dating to 1979. Real-time data are used to implement overall seasonal restrictions and limitations on geological and geophysical exploration. The study provides the only long-term database for evaluating potential cumulative effects of oil- and gas-exploration activities on the entire bowhead-migration corridor across the Alaskan Beaufort Sea. Project reports compare distances from shore and the water depths used by migrating bowheads. Data are collected in a robust GIS-compatible data structure. The bowhead whale is protected under the Endangered Species Act and is of great importance to Alaskan Natives for cultural and subsistence purposes.

Objectives

1. Define the annual bowhead fall migration, significant inter-year differences, and long-term trends in distance from shore and water depth at which whales migrate.
2. Monitor temporal and spatial trends in the distribution, relative abundance, habitat, and behaviors (especially feeding) of endangered whales in arctic waters.
3. Provide real-time data to MMS and the National Marine Fisheries Service (NMFS) on the general progress of the fall migration of bowhead whales across the Alaskan Beaufort Sea for use in protection of this Endangered Species.
4. Provide an objective area-wide context for management interpretation of bowhead migrations and site-specific study results.

Methods Aerial surveys, based out of Deadhorse, Alaska, during September and October, monitor the fall bowhead migration between 140°W. and 157°W. longitudes, south of 72°N. latitude. Particular emphasis is placed on regional randomized transects, statistical tests, and power analyses to assess fine-scale shifts in the migration axis of bowhead whales across the Beaufort Sea, and on the coordination of effort and management of data necessary to support seasonal offshore-drilling regulations. The project analyzes migration timing, distribution, relative abundance, habitat associations, swim directions, water depths, and behaviors (especially potential feeding) of whales, as well as ice type and percentage at bowhead sightings. Belugas, gray whales, and polar bears are regularly recorded along with incidental sightings of other marine mammals. Data are also shared with site-specific studies to define bowhead responses to individual oil-industry activities. Incidental oceanographic observations are shared with the National Ice Center and National Weather Service to ground-truth satellite imagery.

Importance to MMS This continuing MMS study is needed for decisions on environmental assessment and exploration monitoring for past and upcoming OCS activity in the Beaufort Sea (from Lease Sales BF, 71, 87, 97, 124, 144, 170, 186, 195, and 202). It analyses behavioral information needed to identify areas of interest to feeding bowhead whales. In years with active offshore seismic-vessel or drilling operations, the BWASP provides real-time data to MMS and NMFS on each fall migration of bowhead whales across the Alaskan Beaufort Sea for implementing overall limitations on offshore drilling and geological and/or geophysical exploration. Project information is used to ensure that planned activities will not have an unmitigable adverse effect on the availability of the bowhead whale to meet subsistence needs by causing whales to abandon or avoid hunting areas.

Date Information Required: Information is needed each year to monitor the migration of bowhead whales past active seismic, drilling, construction, and production operations. Information from this study also will be needed in support post-lease NEPA documentation for Beaufort Sea Lease Sales in 2003, 2005, and 2007, DPP's, and monitoring of the Northstar and, if approved, Liberty developments.

Revised date: September 2003

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2004

Region: Alaska

Planning Areas: Beaufort Sea, Chukchi Sea, Hope Basin

Type: Cooperative Agreement with CMI

Title: Correction Factor for Ringed Seal Surveys in Northern Alaska

Actual Costs (in thousands):

Period of Performance: FY 1998-2004

FY1998 - \$175

Total Cost: \$175

Conducting Organization: CMI, UAF

Description:

Background Scientists have already developed a protocol for monitoring ringed seal distribution and relative densities in Arctic waters for MMS. They also implemented over 6 field seasons during spring basking periods when the greatest number of seals are hauled out on the ice. This study will augment previous monitoring by permitting estimation of true ringed seal densities based on the number visible from an airplane. Useful information exists on ringed seal ecology and distribution in industrial versus control areas, but not enough to estimate true densities correctly. Scientists have found correction factors developed for harbor seals to be applicable to other years, as long as the correction factors and the survey estimates are in the same areas at similar times of the year. Most aerial surveys for ringed seals have attempted to standardize to late May to early June and to mid-day. The correction factors will facilitate re-analysis of historical data collected in GIS-compatible formats.

Objectives The goal of the study is to estimate a correction factor for the proportion of ringed seals not visible during aerial surveys and thereby, enhance the protocol for estimating Arctic ringed seal densities from aerial monitoring results. The study will also obtain useful quantitative information on ringed seal behavior obtained, as identified in the methods section.

Methods

1. Locate subnivean lairs using dogs trained to alert handlers to ringed seal scents on command.
2. Monitor the use of 20 subnivean lairs by seals using air temperature recorded in lairs by thermistor sensors connected to data loggers.
3. Compare the cumulative frequency of lair use by date among years.

4. During each aerial survey, calculate the proportion of lairs still active based on the temperature records.
5. Instrument a sample of seals with radio- and ultrasonic-transmitters and their behaviors recorded by observers stationed on the ice surface.
6. Partition ringed seals not visible during aerial surveys into those under the ice and those in subnivean lairs.
7. Obtain quantitative information including:
 - a. The temporal pattern in which ringed seals abandon lairs and begin to bask.
 - b. The proportion and variance of the out-of-water population of ringed seals concealed within subnivean lairs during aerial surveys.
 - c. The proportion and coefficient of variation of the population visible during aerial surveys.
 - d. The frequency distribution of distances traveled between winter home ranges and sites occupied during the spring basking period.
 - e. The relationships between date, distance to ambush cover, and group size for seals visible next to basking holes and cracks.

Importance to MMS Industry is planning offshore production of oil in the Beaufort Sea for the Northstar and, if approved, Liberty developments. Undersea-pipeline construction and increased vessel and helicopter traffic probably will generate additional acoustic and visual disturbance of ringed seals in marine areas. Such disturbance has the potential for causing some long-term abandonment of industrial areas. Providing a means to determine the true densities of seals observed in aerial monitoring will help us estimate the number of seals affected by such industrial activity. Also, estimates of absolute population size require a correction factor for the proportion of seals not visible during surveys.

Date Information Required: Study information will be used for the proposed Beaufort Sea Multi-Sale in 2002.

Revised date: September 2003

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2004

Region: Alaska

Planning Areas: Beaufort Sea, Chukchi Sea, Hope Basin

Type: Cooperative Agreement with CMI

Title: Timing and Re-interpretation of Ringed Seal Surveys

Actual Costs (in thousands):

Period of Performance: FY 2001-2004

FY 2001 \$412

Total Cost: \$412

Conducting Organization: CMI, UAF, University of Alaska Southeast

Description:

Background Ringed seals are an important resource for Native people of northern and western Alaska and an important component of the ecology of the northern marine ecosystem. Aerial surveys have been used to monitor trends in the distribution and density of ringed seals in the Alaskan Beaufort Sea without correction for variation in the proportion of seals visible to aerial observers. With CMI support, the investigators used observations on radio-instrumented seals to show that the proportion of seals visible changed rapidly during a typical survey period as seals shifted from resting in lairs to resting in the open. Furthermore, the end of that transition was shown to be associated with measurable changes in snow conditions. In this study, the investigators will develop statistical models of the proportion of seals visible as a function of snow conditions and will use those models to reanalyze data from previous aerial surveys of ringed seals.

Objectives

1. Evaluate the relationship between snow conditions and the number of seals visible during spring surveys.
2. Evaluate methods for monitoring snow conditions and optimal survey times.
3. Reanalyze previous ringed seal surveys from the Beaufort Sea of Alaska.

Methods The study will be conducted at three sites in the vicinity of Point Barrow, Prudhoe Bay and Barter Island. At Prudhoe Bay, seal breathing holes and lairs will be located by trained dogs starting in December or January. Air temperatures inside and outside the lairs will be measured using thermistors with data loggers. Those records will be used to estimate dates and durations of lair use by seals in relation to snow thickness and quality. The proportion of seals in and out of lairs and under the ice will be estimated by radio tracking seals in April – early June. Aircraft will be used to monitor seals when snow gets too soft for surface travel, usually in early June.

Automated meteorological stations will be used to continuously record air temperature, wind speed and direction, and snow temperature in the seal's environment during April – early June at all 3 of the study sites. Historical data on snow and ice conditions will be used to evaluate whether past surveys were conducted before, during, or after the seal's transitions from lairs to resting in the open. If data on snow temperatures over the tundra are strongly correlated with those on the ice, historical data on snow temperatures over tundra will be used to retrospectively apply correction factors to previous surveys. The reliability of Ku-band backscatter radar data for determining changes in snow structure will be tested. To this end, the Jet Propulsion Laboratory will use radar to make a "blind" determination of snow conditions at the three study sites. This result will be compared with data from each of the study sites.

Importance to MMS Industry may submit development and production plans for offshore production of oil in the Beaufort Sea. Post-lease undersea-pipeline construction is expected to result in additional acoustic and visual disturbance of ringed seals in marine areas due to increased vessel and helicopter traffic. Such disturbance has the potential for causing some long-term abandonment of industrial areas. Providing a means to estimate the true densities of seals observed in aerial monitoring will help us estimate the number of seals affected by such industrial activity. Also, estimates of absolute population size require a correction factor for the proportion of seals not visible during surveys.

Date Information Required: For post-lease NEPA documentation for Beaufort Sea Lease Sales in 2003, 2005, and 2007, pre- and post-lease NEPA documentation for Chukchi Sea/Hope Basin Lease Sale in 2007, and DPP's.

Revised date: September 2003

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2004

Region: Alaska
Planning Areas: Beaufort Sea, Chukchi Sea
Type: Interagency Agreement/Competitive
Title: Polar Bear Den Surveys

Actual/Estimated Costs (in thousands):	Period of Performance: FY 1999-2004
FY1999 \$40	
FY2000 \$17	
FY2001 \$150	
FY2002 \$150	
Total Cost: \$357	

Conducting Organization: USGS Biological Resources Division/TBD

Description:

Background Two stocks of polar bear inhabit the Arctic OCS region. The Beaufort stock is shared with Canada and dens partly in the eastern Alaskan Beaufort Sea. Remote sensing of polar bear dens might be more reliable and safer than ground surveys. Aerial denning surveys would provide a measure of reproductive effort and success, and an index to population trends. Such surveys in prospective exploration areas could provide information for avoiding site-specific effects. A scientifically valid estimate of the Chukchi/Bering Sea population size is not currently available and current information on the population dynamics of the polar bear population is incomplete. The USGS-BRD, USFWS, and Russian scientists have conducted previous surveys of polar bear dens. Past survey efforts have been complicated by inconsistencies in survey methodologies, timing, and location and by the large variation in den estimates.

Objectives The goal is to reliably identify subnivean polar bear dens along the North Slope of Alaska.

Methods Phase I of a study will test and evaluate Forward Looking Infra-red (FLIR) technology for conducting effective polar bear den surveys. The evaluation will take place at a workshop in Anchorage where participants would score FLIR aerial videography (recorded during January denning) and discuss the applicability of remote sensing methods and equipment for identifying polar bear dens. The workshop would also summarize existing information on polar bear den distribution and habitat features. The proceedings of this workshop and an evaluation of the success of the FLIR technology for detecting polar bear dens will be published as an interim report. Depending on the success of Phase I, Phase II would further develop (and possibly purchase) appropriate remote sensing technology and design a repeatable survey protocol for surveying polar bear dens. Working jointly with the Fish and Wildlife Service, the protocol will then be used the following winter to catalog polar bear denning sites, correlating them with

denning habitat features and ambient observational conditions in the eastern Alaskan Beaufort Sea. The final report will include the revised final protocol and appropriate analyses of survey results.

Importance to MMS During the environmental review for Lease Sale 170 and the Warthog exploration plan, public concern was expressed regarding the environmental sensitivity of the eastern Alaskan Beaufort Sea and the lack of comprehensive biological baseline information. Information from the den surveys will be useful in decisions regarding mitigation measures. Population-dynamics information will be useful in assessing the effects of development, including habitat alteration, modification, and potential spills on the polar bears of this region. The Chukchi/Bering stock of polar bears is a shared population between the U.S. and Russia. In Russia most denning occurs on Wrangel Island, Herald Island, and the Chukotka Peninsula. Technology developed in this study would permit future joint U.S.-Russia den surveys of the Chukchi/Bering Sea population, developing valid statistical estimates of population status and trends.

Date Information Required: There is an ongoing need for information to monitor polar bear population trends and reproductive effort/success, and to assess potential impacts associated with potential offshore operations. If Phase II is implemented, study information will be used for post-lease NEPA documentation for Beaufort Sea Lease Sales in 2003, 2005, and 2007, DPP's, and related baseline monitoring.

Revised date: September 2003

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2004

Region: Alaska
Planning Areas: Beaufort Sea, Chukchi Sea, Hope Basin
Type: USGS Biological Resources Division
Title: Simulation Modeling of the Effects of Arctic Oil Spills on the Population Dynamics of Polar Bears

Actual Costs (in thousands): **Period of Performance:** FY 1999-2004
FY1999 \$150 (BRD)
Total Cost: \$150 (BRD)

Conducting Organization: USGS Biological Resources Division

Description:

Background In order to predict the effects of oil spills on polar bears, data on oil spill trajectories must be married with data on polar bear distributions and abundance to yield hypothetical patterns of mortality. The long-term effect of the spill on the stability of bear populations can be predicted by applying a population recovery model to mortality data as derived above. A great deal is already known about the distribution and movements of mature female polar bears in Alaska OCS Beaufort Sea planning areas through an ongoing program of satellite tagging and tracking conducted by USGS-BRD. The USGS-BRD maintains a data set on polar bear distribution in Arctic waters. Information is also available on the potential effects of oil on individual polar bears. The MMS has an updateable arctic oil-spill trajectory model that is used each time there is a Beaufort Sea Environmental Impact Statement. The study is coordinated as appropriate with MMS oil-spill modelers.

Objectives The study design will link the efforts of BRD polar bear researchers and MMS oil spill modelers to predict the effects of hypothetical Beaufort Sea oil spills and other postulated mortality on the population recovery of polar bears. The study will develop computer program modules to this end. Specifically BRD researchers will:

1. Develop/refine an independent, conceptual, polar bear population-dynamics model for Alaskan waters, with assumptions and initial conditions that can respond to hypothetical removals. Conduct a sensitivity analysis of this model.
2. Create a database on expected mortality of polar bears under various oil spill scenarios that can be interfaced with oil spill trajectory models.

Methods The study will develop a model of polar bear population dynamics and use it to simulate population-level recovery from hypothesized removals due to potential oil spills. The

model will have mechanisms for linking it with the MMS Oil Spill Risk Analysis (OSRA) model trajectories for the Beaufort Sea. The final work product will include appropriate data bases, computer programs and existing algorithms on polar bear life history, population dynamics, and known seasonal distribution in Arctic waters, based primarily on existing satellite-tracking data on adult female polar bears collected by USGS-BRD. The study will model hypothesized mortality and population recovery of both Beaufort and Bering/Chukchi Sea populations of polar bears in response to Beaufort Sea oil spills and other postulated mortality. BRD scientists will prepare the interactive model, compatible with MMS hardware and software standards at the time of completion, and a user-friendly manual. They will manual demonstrate the model and manual to MMS biologists, varying data input and model assumptions as appropriate for future lease sales.

Importance to MMS Polar bears are known to be highly sensitive to direct oiling. Some subsistence hunters and environmental groups previously expressed opposition to lease sales that might adversely affect polar bears. The study will enhance MMS's ability to predict the effects of a potential oil spill in the Beaufort Sea on large concentrations of polar bears such as those that den on Wrangel Island or that congregate near bowhead whale carcasses. The study will be beneficial in implementing the existing stipulation on protection of biological resources. The study will develop information that addresses public concerns raised during previous outreach efforts.

Date Information Needed: Study information will be used for post-sale NEPA documentation for Beaufort Sea lease sales 186, 195, and 202.

Revised date: September 2003

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2004

Region: Alaska

Planning Area: Beaufort Sea

Type: USGS Biological Resources Division

Title: Use of Sea Ice Habitat by Polar Bears in the Southern Beaufort Sea

Estimated Costs (in thousands):

Period of Performance: FY 2001-2004

FY 2001 \$60 (BRD)

Total Cost: \$60 (BRD)

Conducting Organization: USGS Biological Resources Division

Description

Background Polar bears (*Ursus maritimus*) occupy ice-covered seas in northern and western Alaska. Polar bears remain with the sea ice throughout the year, and their range generally reflects the seasonal extent of sea ice. Availability of their principle prey, ringed seals (*Phoca hispida*), is dependent on the form and stage of sea ice. In particular, the near-shore region of the Beaufort Sea is an important hunting area for polar bears soon after the autumn ice has formed. Near-shore ice also serves as a stable substrate for maternal dens during the winter, and as an area in which seals are hunted by adult female bears with their new young during the spring.

Petroleum companies have extended their activities to include these nearshore areas as potential locations for exploration, construction of facilities, and extraction of oil. In addition to existing development, the petroleum industry will likely become increasingly interested in developing nearshore polar bear habitat as new recoverable hydrocarbon deposits are identified. Industrial development in polar bear habitat may result in displacement of bears from foraging and denning habitat because of activities associated with exploration and construction. Bears may die or experience chronic negative health effects as a result of spills of crude oil or other chemicals. In general, polar bears may be exposed to toxic substances and have an increased likelihood of direct interactions with humans.

Polar bears inhabit an environment that constrains direct observation of their behavior. Additional information about habitat use by bears would help managers make decisions regarding how to conduct human activities relative to sea ice conditions in polar bear habitat in the southern Beaufort Sea. With better data on polar bear behavior, the effect of human perturbations could possibly be reduced if human activities were managed to take into account polar bear ice-habitat relationships. Data on polar bear movements and sea ice conditions exist but have not been merged to permit analysis of polar bear habitat preferences relative to ice conditions.

Objective The objective of this study is to quantitatively describe the ice habitat types preferred by polar bears in the southern Beaufort Sea.

Methods Scientist will associate polar bear locations obtained by satellite radio-telemetry with NOAA weekly ice charts. Ice charts that include the coast of the Beaufort and Chukchi Seas are available and updated on a weekly basis from the National Ice Center (Washington, D.C.). Researchers will obtain this information from the National Ice Center through the Internet. Charts are geo-referenced and ice is identified by form, stage, and the percent of open water. Data are available either as graphical information files for producing hard copies or as geographic information system (GIS) software ARC/INFO export files for spatial analysis. Locations have been recorded for instrumented adult female polar bears in Alaska since 1985. Scientists will use ARC/INFO to:

1. Extract ice habitat attributes and attach those attributes to polar bear locations.
2. Analyze habitat preferences and avoidance using log-linear statistical models.
3. Compare habitat use by season and reproductive status of bears.

Importance to MMS Polar bears are highly susceptible to spilled oil. The species is protected under the Marine Mammal Protection Act and any “take” by disturbance, mortality, or otherwise requires a Federal Permit. MMS analysts can address concerns of polar bear welfare raised in EIS’s with the information gained through this study. Industrial activity in the southern Beaufort Sea is ongoing and will continue into the future, necessitating baseline data of polar bear habitat use.

Date Information Required: Information from this study can be used for post-sale NEPA documentation for Beaufort Sea lease sales 186, 195, and 202.

Revised date: September 2003

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2004

Region: Alaska
Planning Areas: Beaufort and Chukchi Seas
Type: Cooperative Agreement with CMI
Title: Satellite Tracking of Eastern Chukchi Sea Beluga Whales in the Beaufort Sea and Arctic Ocean

Actual Costs (in thousands) **Period of Performance:** FY 2000-2004
FY2000 \$75
Total Cost: \$75

Organization Conducting: CMI, UAF

Description:

Background Beluga whales are important subsistence species for indigenous people of the Alaskan Arctic and sub-Arctic coasts; more than 300 belugas are harvested annually by Alaska Native subsistence hunters. Studies funded by OCSEAP/MMS in the early 1980's provide information about reproduction, food habits, and distribution and abundance in summer. More recent studies conducted by the Alaska Department of Fish and Game (ADF&G), National Marine Fisheries Service (NMFS), and the Alaska Beluga Whale Committee (ABWC) provide information about harvest levels, genetic stock identity, and abundance in summering areas. A 1994 NRC report recommends satellite tagging, stock identification, and monitoring studies for belugas. Satellite tagging offers a proven cost-effective and technologically sound approach to obtaining information needed on migration patterns and feeding areas. Scientists have captured belugas and instrumented them with satellite-linked tags at a variety of locations across the Canadian Arctic. However, belugas tagged in Canada are only one of several beluga stocks that are important to Alaska subsistence hunters and that are presumed to winter in the Bering Sea. Data are needed on the other stocks, particularly the Chukchi Sea stock. The study will emphasize cooperation between the MMS, local government, subsistence hunters, and scientists in its planning and execution.

The Alaska Beluga Whale Committee has worked cooperatively with ADF&G, the NSB, and NMFS in a pilot study to attach satellite tags to beluga whales in Alaska. In 1997, two ABWC representatives (one scientist, one hunter) participated in the highly successful joint MMS-Canadian Fisheries Joint Management Committee tagging venture in the Mackenzie estuary. This study builds on a pilot study initiated in September 1998, during which tags were successfully placed on belugas at Point Lay. Whales monitored during the pilot study, predominately adult males, summered in the Beaufort Sea and Arctic Ocean. Additional data is needed on adult females and juveniles to test whether this trend is for all demographic classes of the eastern Chukchi Sea stock. This cost-effective, cooperative study combines resources from

the ABWC, ADF&G, NSB, UAF and MMS. MMS would contribute less than 30 percent of the estimated total cost.

Objectives The objectives of this study are to:

1. Develop a cooperative study to capture and satellite tag beluga whales from the eastern Chukchi Sea stock at Pt. Lay. Cooperators in this study will be the ABWC, ADF&G, UAF, NSB, MMS, and other interested parties as appropriate.
2. Characterize seasonal movements and diving behavior of the Chukchi Sea and eastern Bering Sea beluga whales. Evaluate which regions of the pack ice they use after leaving coastal summer concentration areas. Estimate whether age- or sex-specific differences exist in habitat use.

Methods Satellite-linked tags will be applied to beluga whales during summer/fall at Pt. Lay in the Chukchi Sea. The tags will be designed to give frequent, periodic locations along with time and date of transmission, in addition to data about dive depth and duration. Data will be downloaded into a GIS (ARC/INFO) database and displayed and analyzed along with sea-ice information. Dive depth tags will be evaluated against a detailed bathymetric grid.

Importance to MMS The study will:

1. Increase our knowledge of the migratory movements, wintering behavior, and feeding areas of belugas in Arctic waters.
2. Be used in support of environmental assessments for Arctic lease sales.
3. Provide especially pertinent information relative to protection of marine mammals and subsistence as required with the Marine Mammal Protection Act.
4. Be needed for post-sale mitigation and exploration plan reviews.

Date Information Required: The study will provide information to support proposed lease sales in the Beaufort and Chukchi Seas and monitoring. Interim reports will be available to MMS following each tagging season. Real-time location data for tagged belugas will be available to all cooperating parties throughout the project.

Revised date: September 2003

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2004

Region: Alaska

Planning Areas: Beaufort Sea and North Slope

Type: Interagency Agreement

Title: Demography and Behavior of Polar Bears Feeding on Stranded Marine Mammal Carcasses

Actual Costs (in thousands):

Period of Performance: FY 2002-2004

FY 2002 \$217

Total Cost: \$217

Conduction Organization: USFWS

Description:

Background: In the Beaufort Sea, polar bears make extensive movements between the United States and Canada. Alaskan polar bears spend most of the year on the drifting pack ice, but in late summer and fall, polar bears travel along the coast and barrier islands of Alaska and have been observed feeding on stranded marine mammal carcasses. In recent years large numbers of polar bears congregate at whale harvest sites near Kaktovik, Barrow, Cross Island, and barrier island complexes along the Beaufort Sea. In addition, an increase in polar bear numbers and a seasonally earlier and more protracted use of the Beaufort Sea coastline and barrier islands in Alaska have been noted in recent years.

Certain sex-age classes of polar bears may use beached marine mammal carcasses more frequently than other sex-age classes. Studies by Canadian scientists indicate that on sea ice, independent yearlings, subadults, and family groups may be displaced from their kills by larger, more dominant bears (Stirling 1974). Stranded marine mammal carcasses may provide an important alternative food source to animals unable to compete with dominant male polar bears for their primary food source, ringed seals. Marine mammal carcasses may also be important during periods of a polar bear's life cycle when energetic demands are increased. Examples are females with increased energetic costs associated with milk production for cubs and younger bears with increased metabolic needs associated with growth. Bears in these situations are more likely to become nutritionally stressed (Lunn and Stirling 1985).

Recent estimates of potential mortality of polar bears due to oil spilled from OCS developments (appended to the Liberty Final EIS) suggest that most mortality of bears due to spilled oil is likely to occur among bears concentrating on or near barrier islands. For the latter analysis, bears on islands were assumed to be exposed to spilled oil and thus, die. This assumption was applied because existing telemetry data are not sufficiently accurate to allow determination of how bears allocate time between terrestrial and open water habitat. However, bears remaining on land when oil is present are obviously at much lower risk than bears entering water. Estimates of bear mortality due to oil spills would be more realistic and have greater utility if they

incorporated information on patterns of use of land versus water habitat (and associated risks) by bears forming the concentrations discussed above. This relationship is especially important since the most vulnerable class of bears is likely to be demographically important females.

No systematic observations have been conducted to quantify the level of use or potential importance of marine mammal carcasses to certain age and sex classes of polar bears. Little information is available to assess how bears consuming carcasses allocate time between land and water habitat. If such information were available it would be particularly useful for oil spill risk assessment. For example, if bears consuming carcasses tend to remain on land for extended periods (i.e. days) while alternating feeding and resting, and not enter adjacent water, they are likely to be at less risk to exposure to encroaching spilled oil than bears that frequently enter water.

Objectives: The purposes of this study are to identify the magnitude of interchange of bears to and from feeding sites, the sex/age composition, utilization patterns, and behaviors of polar bears using beach cast marine mammal carcasses along the Beaufort Sea coastline in Alaska.

Methods

1. Monitor polar bears feeding on the remains of a hunter-harvested bowhead whale carcasses at Kaktovik and other locations along the Beaufort Sea coastline.
2. Conduct observations with binoculars and spotting scopes during daylight hours for up to 30 days to estimate the exchange rates, sex/age composition, activity budgets, habitat use, and behavior of bears at the feeding site.
3. Complement these observations by information on utilization patterns and demography obtained from various aerial surveys conducted by MMS and industry.

Importance to MMS Oil and gas operations on the Coastal Plain of the Beaufort Sea are ongoing and expanding to offshore areas. Recent EIS's (e.g., Northstar) have highlighted the need for additional information on polar bear use of coastal habitats. Estimating the number, sex, and age class of polar bears using marine mammal carcasses will help managers document and evaluate the ecological significance of coastal areas to polar bears. Results from this study can also be used to implement measures that decrease impacts of human activities on polar bear feeding habitat and minimize human interactions with polar bears.

Date Information Required: Information from this study will be used for post-lease NEPA documentation for Beaufort Sea lease sales 186, 195, and 202; post-sale mitigation; exploration plan reviews; and DPPs.

Revised date: September 2003

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2004

Region: Alaska

Planning Areas: Beaufort Sea

Type: Joint Funding, Interagency Agreement

Title: Polar Bear Population Monitoring Workshop

Actual Costs (in thousands):

FY 2002 \$10

Total Cost: \$10

Period of Performance: FY 2002-2004

Conducting Organization: USFWS

Description:

Background Offshore oil and gas development is increasing, as evidenced by Northstar, Liberty and other prospects, yet their cumulative impacts on polar bear populations remain largely anecdotal, or unknown. A comprehensive integrated approach to monitor the effects of development on polar bears is warranted.

The Marine Mammal Protection Act allows for the incidental take of polar bears by oil and gas activities provided that the sum total of effects results in a negligible effect to populations. The incidental take regulations are important to oil and gas operators in protecting personnel and protecting polar bears. They also provide a mechanism for monitoring effects of activities on polar bears and to minimize the chance of incidental take. In the past, potential impacts from specified activities have been monitored on a case-by-case basis; however, no long term monitoring program exists to evaluate the cumulative effects of industrial activities on polar bears in the Beaufort Sea.

Population research on polar bears has been conducted in Alaska since 1968 and has yielded valuable information regarding population ecology, den ecology, recruitment and survival, and habitat use by polar bears. Yet this information is fragmented and was not collected in a manner designed to specifically monitor the effects of human activities on polar bears or their primary prey, ringed seals. Results from these studies and additional studies conducted in the future may form a basis for a long-term monitoring program. A monitoring program should evaluate potential long-term direct and subtle effects of human activities on polar bear populations, their prey, habitat, and use of important habitats in consideration of natural variation inherent with the population dynamics of polar bears.

Objectives Hold a workshop to identify the components and structure for a polar bear population monitoring program needed in order to more accurately assess the effects of oil and gas development on polar bears in the Beaufort Sea area.

Methods MMS would pay up to 25% of the costs of a facilitated workshop to be held in Anchorage that would include scientists and managers with expertise in: impact assessment; polar bear ecology (including feeding ecology); habitat evaluation procedures; and population monitoring. The lead agency (either USFWS or BRD) would be responsible for preparing a monitoring plan incorporating the consensual recommendations of the attendees.

Importance to MMS EIS's and EA's for OCS Leasing and other OCS activities require an assessment of the effect of the activities upon the resources identified. Implementation of a suitable monitoring program will enhance efforts to understand the effects of disturbance and other forms of incidental take related to polar bear habitat quality and use, prey availability, and population recruitment and survival. Development of a monitoring plan would help to manage mineral resources in an environmentally sound manner, and to more clearly predict the effects of oil and gas activities and thus to minimize the effects of these activities on polar bears.

Date Information Required: Information from this study will be used in post-lease NEPA documentation for Beaufort Sea lease sales 186, 195, and 202; post-sale mitigation; exploration plan reviews; and DPP's.

Revised date: September 2003

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2004

Region: Alaska
Planning Areas: Beaufort Sea, Chukchi Sea
Type: Cooperative Agreement with CMI
Title: King and Common Eider Migrations Past Point Barrow

Actual Costs (in thousands):	Period of Performance: FY 2002-05
FY 2002 \$196	
FY 2003 \$35	
Total Cost: \$231	

Conducting Organization: CMI, UAF

Description:

Background King (*Somateria spectabilis*) and common eiders (*S. mollissima v-nigra*) are an important resource for Native people in northern Alaska and Canada. Residents of Barrow harvest more king and common eiders than any other species of waterfowl (Fuller and George 1977). Most individuals of both species nesting in Alaska and Canada pass very close to shore at point Barrow, Alaska, twice annually – during their northward, spring migration and their southward, fall migration. Based on previous surveys conducted at Barrow from 1953 to the present, Suydam, et al. (2000) argued that the king eider population appeared to have relatively constant numbers between 1953 and 1976, but may have declined by about 53% between 1976 and 1996. Those authors also argued that the common eider population may have declined by a similar magnitude (56%) during the same period.

Although eider surveys have been conducted periodically at Pt. Barrow since 1953, a comprehensive survey was last completed in 1996. This study will support a repeat of the previous surveys, using the same location, methods and some of the same observers that participated during 1996. This effort will expand the existing synthesis of eider migration data compiled in the earlier publication (Suydam 2000) and should lead to a better understanding of the timing of migrations and use of the Alaskan Beaufort Sea OCS and coastal environments by the subject species. This study also is synergistic with three other ongoing MMS studies - two that address habitat use and movements of king eiders and a third that is developing recovery models for these and related species.

Objectives

1. Estimate the number of king and common eiders passing by Point Barrow in spring and fall 2003-2004 and compare with counts made in 1996.

2. Estimate the sex ratios of king and common eiders passing by Point Barrow in spring 2003 and 2004.
3. Estimate the timing and sex/age composition of king and common eiders leaving the Beaufort Sea in the summer of 2003 and 2004.
4. Investigate possible correlation among weather conditions and high passage rates of eiders within each migration.

Methods Investigators will follow the same methodology as was used in previous surveys at the same site.

1. One to three observers will count eiders from the base of the Point Barrow spit between approximately 10 September and 30 October.
2. Make counts up to 10 hours each day in September, but limit to 2 hours per day by October as day length decreases.
3. Collect data on weather conditions (temperature, wind speed, wind direction, cloud cover, and visibility). For each flock sighted, record: time, direction of travel, species composition, number sighted, ratio of males to females for each species, and other comments on behavior.
4. Collect data from subsistence hunters regarding species, sex, and age composition, status of molt of late summer flocks.
5. Analyze data following previous methods of Suydam, et al. (2000).

Importance to MMS MMS will use the data on king and common eider distribution and abundance from this study, and related studies mentioned above, to model the effect of various oil spill scenarios on the Beaufort Sea eider population. MMS will use information on basic natural history and ecology to improve assessments of potential impacts of oil development and, potentially, to develop mitigation measures for future OCS, and supporting onshore, development.

Date Information Required: MMS will use information from this study for post-lease NEPA documentation for Beaufort Sea lease sales 186, 195, and 202; post-sale mitigation; exploration plan reviews; and DPPs.

Revised date: September 2003

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2004

Region: Alaska
Planning Areas: Beaufort Sea
Type: Cooperative Agreement with CMI
Title: Population Structure of Common Eider Nesting on Coastal Barrier Islands Adjacent to Oil Facilities in the Beaufort Sea

Actual Costs (in thousands): **Period of Performance:** FY 2002-05
FY 2002 \$138
Total Cost: \$138

Conducting Organization: CMI, UAF

Description:

Background Surveys of sea ducks migrating past Pt. Barrow from 1953 to the present suggest that, although common eiders maintained relatively constant numbers between 1953 and 1976, they may have declined by about 56% between 1976 and 1996 (Suydam, et al. 2000). While over 70,000 individuals were estimated to have passed Pt Barrow on the 1996 spring migration, and over 111,000 on the fall migration, no total estimate has been given for the migration because no correction factor has been established for the proportion of birds migrating inland or offshore, beyond the field of vision of observers at the Pt. Barrow observation post. Of these migrating birds, a few thousand are believed to inhabit the coastline of the central Beaufort Sea, and typically about 500 pairs nest on barrier islands in that region each year.

Some wildlife managers have suggested that common eiders breeding on distinct islands, or island complexes, may be genetically distinct, and thus should be managed as separate units. If the posited population structure does exist, an accidental oil spill or disturbance from industrial development could destroy a common eider nesting colony (e.g. one nesting island) and it is possible that some unique genetic variant could be lost. In this study, investigators will use three classes of genetic markers that differ in their mode of inheritance to document the level of population structuring among common eiders breeding on coastal barrier islands of the central Beaufort Sea. Stock discreteness will also be evaluated on a broad scale for birds collected throughout Alaska and western Canada.

Objectives

To document population structuring among common eiders of the Pacific race at the macro- and micro-geographic levels.

Methods

1. Take tissue collections from common eiders nesting on barrier islands of the central Beaufort Sea for comparison with tissues available from the Yukon-Kuskokwim Delta, Aleutian Islands, and western Canada.
2. Assay and analyze autosomal and sex-linked microsatellite loci, and mitochondrial and nuclear DNA sequences to evaluate genetic discreteness.

Importance to MMS MMS will use findings from this study to assess potential impediments to the recovery of common eider population subunits if such subunits are affected by disturbance or pollution related to oil and gas development.

Date Information Required: MMS will use information from this study for post-lease NEPA documentation for Beaufort Sea Lease Sales in 2003, 2005, and 2008; post-sale mitigation; exploration plan reviews; and DPP's.

Revised date: September 2003

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2004

Region: Alaska
Planning Areas: Beaufort Sea, Chukchi Sea
Type: Cooperative Agreement with CMI
Title: Breeding Biology and Habitat Use of King Eiders on the Coastal Plain of Northern Alaska

Actual Costs (in thousands): **Period of Performance:** FY 2002-04
FY 2003 \$105
Total Cost: \$105

Conducting Organization: CMI, UAF

Description:

Background King eiders migrate across the OCS areas of the Chukchi and Beaufort Seas of Alaska. Migrations are characterized by large groups of birds that pass across the OCS areas in a restricted time and space. Thus, king eiders may be vulnerable to oil spills and possibly other oil and gas activities. King eiders are a species of special concern because the population using the Beaufort Sea appears to have declined by more than 50% between 1976 and 1996. The breeding biology of king eiders is not well known in either disturbed or undisturbed areas. There have been few studies dedicated to breeding biology of king eiders and most available information is anecdotal that was collected secondary to studies of other species or issues. Understanding the breeding biology of king eiders is important to better understanding and evaluating the causes for the possible population decline, specifically for evaluating any potential impact from oil and gas exploration or development. This study is related to and is synergistic with three other ongoing MMS studies: 1) a CMI study at Point Barrow that is a continuation of periodic counts of eiders migrating offshore the village; 2) a CMI study in which up to 60 king eiders are to be instrumented with implanted satellite transmitters and monitored during fall staging and migration, and spring migration; 3) a USGS BRD study in which recovery models are being developed for several species of water birds, including king eiders.

Objectives This study is designed to provide comparative data on the breeding biology and habitat use of king eiders nesting at an undisturbed site (Teshekpuk Lake) and a developed site (Kuparuk) on the Arctic Coastal Plain of Alaska.

Methods Observers will:

1. Search study areas in aircraft and on foot. Document distribution and abundance of king eiders and phenology of king eider nesting. Map nests and king eiders using GPS.
2. Record numbers of males, females and pairs daily to estimate arrival dates, departure dates of

males, departure dates of failed or non-breeding females and females with broods.

3. Classify habitat associated with pre-nesting, nesting, brood-rearing, and post-nesting activities. Estimate landcover status of nests for each nest using the BLM/Ducks Unlimited Landcover Inventory database for NPR-A, and WERC habitat classes.
4. Monitor nests to evaluate incubation patterns and hatching success. Download data using a remote cable to avoid flushing birds off nests. Estimate nest success using the Mayfield method as modified by Johnson (1979). Monitor broods for as long as possible to estimate survival of the young.

Importance to MMS MMS will use data on king eider distribution and abundance from this study, and related studies mentioned above, to model the effect of various oil spill scenarios on the Beaufort Sea king eider population. MMS will use information on basic natural history and ecology to improve assessments of potential impacts of oil development and, potentially, to develop mitigation measures for future OCS, and supporting onshore, development.

Date Information Required: MMS will use information from this study for post-lease NEPA documentation for Beaufort Sea lease sales 186, 195, and 202; post-sale mitigation; exploration plan reviews; and DPP's.

Revised date: September 2003

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2004

Region: Alaska
Planning Areas: Beaufort Sea, Chukchi Sea, Hope Basin, and Norton Basin
Type: Interagency
Title: Development of Remote Sensing Survey Techniques for Marine Mammals and Birds in the Arctic

Actual Costs (in thousands): **Period of Performance:** FY 2003-2005
FY 2003 \$210
FY 2004 \$47
Total Cost: \$257

Conducting Organization: National Marine Mammal Laboratory and USFWS

Description:

Background Conducting assessments or tracking trends of Arctic marine-wildlife populations is extremely difficult, logistically complex, and expensive. Past efforts have generally produced unsatisfactory population estimates due to high variance associated with the estimates. This primarily results from the inability to design a survey that can sample large geographic areas rapidly with a high degree of accuracy. Aerial surveys for pacific walrus, ringed seals and a variety of sea ducks undertaken from the 1960's to the 1990's exemplify this problem.

The application of remote sensing techniques to study of marine animals is in its infancy. Vertical aerial photography with medium and large format precision mapping cameras has received the most attention to date. Descriptions and applications for infrared and ultraviolet films and sensors have been explored with some successful results. Techniques for counting groups of animals and characterizing habitats they occupy with visual aerial surveys are generally crude, and the results tend to include considerable observer bias. Inconsistency within and between surveys is often high, making trend analysis impossible. High-resolution commercial imaging satellites have recently become available and may offer sub-meter resolution by early 2002 that could replace visual surveys for some marine species. It is reasonable to assume that this technology will continue to rapidly improve as high consumer and governmental interest exists for these products on a worldwide basis. Existing airborne infrared technology operating in thermal wavelengths also has some potential for detecting and enumerating pinnipeds hauled out on sea ice. Remote sensing based surveys potentially provides a permanent data record that can be carefully analyzed in the office, free of observer-based biases. They will be useful for analyses of habitat correlates, group behavior, and reproduction. Additionally, all data from remote sensing survey efforts and the basis for the analysis and conclusions from the data obtained would potentially be accessible to future workers.

The U. S. Fish and Wildlife Service recently successfully obtained satellite images of Pacific walrus hauled out on numerous beaches on Round Island (Bristol Bay, Alaska), made initial collections of walrus on land and sea ice haulouts with an across-track thermal scanner, and collected images (from 2,000 to 12,000 feet above sea level) of walrus on sea ice. All of these initial trials have produced useful data, and have demonstrated promising applications to survey problems.

Objectives

1. To explore and develop techniques for using space-based remote sensing system to detect and enumerate marine mammals and birds in Arctic habitats.
2. To test the capabilities of airborne thermal systems and digital and film photography from high altitudes.
3. To detect and enumerate pinnipeds hauled out on land and sea ice and study the application of these technologies to future surveys.

Methods The following activities are in priority order and can be undertaken all in one year or in phases over the life of the project. Each activity can be pursued independent of the other, and results can be pooled later to produce a comprehensive report. All of the following methods to detect and enumerate marine mammals or birds with remote sensing systems and characterize the habitats they occupy will be analyzed with raster based software products. Ground truthing will be achieved with land and ship based counts, and density correction factors developed by using conventional aerial photography techniques, which are:

1. Obtaining commercial satellite images of pinnipeds hauled out on sea ice and land, and as possible other marine mammals or birds in marine waters, of the Chukchi and Bering Seas, and Bering Strait.
2. Testing airborne thermal imagery systems to evaluate their capabilities to detect and enumerate pinnipeds hauled out on sea ice both during the day and at night, and as possible other marine mammals or birds in marine waters, and estimate the maximum altitude possible for collection of images with useful resolution of surveys.
3. Using digital and film based aerial photography from a variety of altitudes, analyzed with visual as well as computer based techniques, to estimate the optimum resolution and maximum scale and altitude useful for surveys of various species.

Importance to MMS Marine mammals and birds are significant members of Arctic marine ecosystems, and important to the subsistence culture of Native Arctic peoples. Environmental assessments of all species in the Chukchi Sea and throughout the Pacific Arctic are impaired by the lack of current population information. Even if funding for surveys were available, existing techniques would not always produce population estimates with the confidence levels necessary to meet environmental assessment needs and the analysis of trends that will be desirable in the future.

Date Information Required: Information is needed after 2003 to support NEPA documentation for: monitoring at Northstar; post-lease NEPA documentation for Beaufort Sea lease sales scheduled for 2003, 2005 and 2007; a Chukchi/Hope Basin Sale in 2007; Cook Inlet lease sales in 2004 and 2006.

2003

Revised date: September

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2004

Region: Alaska

Planning Areas: Beaufort Sea

Type: Competitive or Interagency

Title: Protocol to Deflect Migrating Bowhead Whales Away from an Oil Spill

Actual Costs (in thousands):

Period of Performance: FY 2003-2004

FY 2003: In Procurement, TBD

Description:

Background As a member of the North Slope Spill Response Project Team, MMS utilizes the Alaska Clean Seas (ACS) Technical Manual in the unlikely event of a large oil spill in the Beaufort Sea. In addition, oil companies submit an Oil Prevention and Technical Plan (OPTP) to MMS for Federal approval. While these plans consider deflection of polar bears and waterfowl, neither the ACS Technical Manual nor the OPTP deal specifically with bowhead whales, an endangered species and a most important species to North Slope subsistence villages. The study would test methods and develop a step-down protocol for on-scene managers to rapidly mitigate the effects of a large oil spill on bowhead whales.

Objectives The overall goal of the study is to develop guidelines for keeping bowhead whales away from large oil spills. Specific objectives for meeting this goal are to:

1. Analyze the literature on potential methods (e.g., noise) for herding or deflecting cetaceans away from oil spills or other effects.
2. Develop a workable field protocol for using tested methods to keep bowhead whales away from a large oil spill.
3. If necessary and feasible, conduct selected field tests to evaluate the most effective ways to deflect captive cetaceans and/or bowhead whales away from a proscribed area.

Methods Analysis of the literature will consider the potential for use of acoustic disturbance (e.g., seismic arrays, icebreaker cavitations, whale boats, orca noise), visual disturbance (e.g., low-flying aircraft), and physical barriers (e.g., oil booms, stationary nets). The protocol will have a rapid-deployment quality in the unlikely event of a large oil spill. The cost of implementing the protocol should be considered, but should not limit important workable options. The purpose of the protocol is to exclude or deflect migrating whales away from the perimeter of a large oil spill without scattering whales in adverse directions. Variables to consider that might limit the effectiveness of certain options include ambient ice type and ice concentration, competing disturbances from oil-spill cleanup activities, and uncontrolled vessel and air traffic.

Appropriate permits should be obtained for field testing, if necessary. Any field testing involving bowhead whales will be carefully coordinated with the National Marine Fisheries Service and the Alaska Eskimo Whaling Commission in advance to avoid or minimize the potential for disturbance to the subsistence harvest.

Importance to MMS It is important to update and augment the ACS Technical Manual relative to bowhead whales. A protocol for keeping bowheads away would likely become a key part of any first-line response in the unlikely event of a large oil spill in the Beaufort Sea. The worst case would be a well-head blowout at Northstar and/or Liberty production facilities. The protocol would help reduce the potential for any oil-spill-related mortality or sublethal effects (e.g., feeding and reproduction) to this endangered species. While implementing the protocol might add to the expected disruption of the whale harvest in the year of any large oil spill, it would reduce the likelihood and scope of potential damage relative to perceived tainting of muktuk and other tissues. In their 2001 Arctic Region Biological Opinion, National Marine Fisheries Service makes a Conservation Recommendation that MMS study “the possible use of air guns as a deterrent for bowhead whales near an oil spill.”

Date Information Required: The protocol would be used immediately to update the ACS Technical Manual relative to oil-spill preparedness at Northstar. The information is also needed for oil-spill preparedness at Liberty, which, if approved, has an uncertain schedule for development as of September 2003.

Revised date: September 2003

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2004

Region: Alaska
Planning Area: Beaufort Sea
Type: Competitive
Title: Analysis of Covariance of Human Activities and Sea Ice in Relation to Fall Migrations of Bowhead Whales

Actual Costs (in thousands): **Period of Performance:** FY 2004-2005
FY 2002 \$135
FY 2004 TBD
Total Cost: \$135

Conducting Organization: LGL, Ltd.

Description:

Background Comprehensive analysis of the potential effects on bowhead whales of oil-industry activities has been limited by the resolution of data available on these activities and by disparate survey methodologies used to obtain whale data. Quantitative data on historical human/industrial activities and sea ice in the Alaskan Beaufort Sea will become available upon completion of the study "Reference Manual and GIS Overlays of Oil-Industry and Other Human Activity (1970-1995) in the Beaufort Sea," (2002-071) to be completed in 2004. This follow-on study will compare that information with available bowhead distributional and behavioral data. Specific hypotheses will be tested to estimate statistical significance of relationships of key variables.

Objectives The goal is to estimate the significance of hypothesized relationships of previous oil-industry activity and sea ice on the Beaufort Sea distribution and behaviors of bowhead whales. Specific objectives are to:

1. Assess the comparability of bowhead whale data collected by site-specific and broad-area surveys and the feasibility of pooling these data to detect whale distributional shifts or behavioral changes up to 40 miles from noise sources.
2. Obtain from available information appropriate measures of sea ice for covariant analysis with whale distribution data.
3. Present preliminary tests and findings, define biases and assumptions, and recommend appropriate statistical procedures (e.g., analysis of covariance, regression techniques, K-S tests, spatial analysis, computer modeling).
4. Apply applicable procedures to test hypotheses on relationships of the timing, location, and

activity status of oil-industry/human activity and the distribution and behavior of bowhead whales (1979-1998).

Methods

1. Utilize existing data in the recently developed MMS database for Beaufort Sea human activity and data in the MMS Bowhead Whale Aerial Survey Project database.
2. Consider positions and daily activity status of each drilling platform, helicopter, icebreaker, and other support vessels.
3. Adopt similar measures between years to facilitate inter-year comparisons and trend analysis.
4. Control for presence of commercial vessels, subsistence hunting, and low-flying aircraft.
5. Evaluate site-specific and wide-area data from MMS- and oil-industry-funded surveys of the fall distribution of bowhead whales (1979-1998) for applicability and pooled analysis.
6. Using appropriate inferential statistical procedures, test hypotheses for significant relationships of human activities and bowhead distribution and evaluate power of tests.
7. Produce a final report suitable for a wide audience, including North Slope subsistence whaling villages.

Importance to MMS Information from the study will be valuable to the consultative process under the existing stipulation on subsistence whaling and other subsistence activities (Stipulation No. 5, Sale 170). It addresses:

1. Long-standing concerns about oil-industry activity raised by subsistence whale hunters.
2. Site-specific information needs expressed by oil-industry representatives at previous government workshops on developing site-specific monitoring guidelines.
3. Important study recommendations made at the Arctic Seismic Synthesis and Mitigating Measures Workshop (Barrow, Alaska, March 1997).

Date Information Required: Study information is needed for post-lease NEPA documentation for Beaufort Sea Lease Sales in 2003, 2005, and 2007, and DPP's.

Revised date: September 2003

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2004

Region: Alaska

Planning Areas: Cook Inlet

Type: Interagency

Title: Distribution and Abundance of Harbor Seals

Actual Costs (in thousands):

Period of Performance: FY 2003-2004

FY 2003 \$300

Total Cost: \$300

Conducting Organization: National Marine Mammal Laboratory

Description:

Background Harbor seals have been identified as a “keystone” species in the Cook Inlet and Gulf of Alaska marine environment. They represent a top-level predator in the food chain and an abundant species that occurs on the OCS year-around. The western Gulf of Alaska/Cook Inlet population of harbor seals has declined drastically since 1976 (Pitcher 1990). Any perturbations that might be associated with Cook Inlet oil and gas activities could threaten this depleted population. Information on the current trend in the population is needed to adequately assess potential effects of oil and gas activities on this population. Their distribution could be affected by operations, and their abundance probably could be affected by a substantial oil spill. National Marine Fisheries Service, with support from the MMS, would map the distribution and estimate the abundance of harbor seals in Cook Inlet/Shelikof Strait.

Objectives To provide a sound, scientific protocol for aerial surveys to evaluate harbor seals in the Cook Inlet/Shelikof Strait Area.

Methods

1. Review and refine the previously established protocol for harbor seals by aerial surveys including information gleaned from EVOS Prince William Sound harbor seal surveys.
2. Estimate relative abundance and density of hauled out harbor seals along the coast of the Alaskan Peninsula, Kodiak/Afognak Islands of Shelikof Strait.
3. Correlate harbor seal densities along the coast with environmental parameters.

Importance to MMS This study will provide a sound, scientific protocol for aerial surveys to evaluate harbor seals in the Cook Inlet/Shelikof Strait area. Updated information on important biological populations in proposed oil- and gas-lease-sale areas is used for EIS’s and post-lease assessments. Population estimates derived during this study will facilitate post-sale mitigation.

The study will also provide information that addresses public concerns raised during outreach efforts. Like the Steller sea lion, which has been placed on the Endangered Species List, the western Gulf of Alaska/Cook Inlet population of harbor seals have drastically decline in the past 20 years. Any perturbations that might be associated with Cook Inlet oil and gas activities could threaten this depleted population. Information on the current trend in the population is needed to adequately assess potential effects of oil and gas activities on this population.

Date Information Required: This study will provide information for post-lease NEPA documentation for proposed Cook Inlet Lease Sales in 2004 and 2006.

Revised date: September 2003

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2004

Region: Alaska

Planning Areas: All Alaska Planning Areas

Type: Contract

Title: Update Oil Industry Labor Factors for Alaska Manpower Model

Actual Costs (in thousands)

Period of Performance: FY 1998-2004

FY 1998 \$132

FY 2000 \$11

FY 2001 \$39

Total Cost: \$183

Conducting Organization: Jack Faucett & Associates

Description:

Background The Manpower Model was created in the late 1970's and early 1980's to project the number of workers directly employed in proposed OCS exploration and development activities. This data is used in another model to predict secondary employment and population. The employment data from the Manpower Model and the secondary employment and population data are used in EIS's. The input factors to the Manpower Model were based on information, no more current than the early 1980's, from industry on the actual number of workers used for 20 different tasks and numerous subtasks through the full range of activity from exploration and development to production. Technology has changed sufficiently that the input variables to this model should be re-examined and adjusted. The employment and population projections in recent EIS's do not reflect current industry practices and technology. Information about current industry practices is best obtained from industry representatives and consultants to industry.

Objectives The objective of this study is to update the Manpower Model with input variables that accurately reflect the number of workers needed to complete tasks associated with exploration, development, and production on the OCS.

Methods

1. Interview industry representatives and possibly knowledgeable consultants to the oil and gas industry.
2. Estimate number of workers and amount of time needed to complete the tasks and subtasks defined in the Manpower Model.
3. Estimate costs by task.
4. Input these updated oil- industry-labor and cost factors to the Manpower Model.

5. Test the Manpower Model to ensure it is functioning properly with the updated factors.
6. Document the factors and the model.

The current Manpower Model has one set of factors for all of Alaska. The update will be for Arctic operations only.

Importance to MMS Projections of direct OCS employment, secondary employment, and population in Arctic region EIS's will be more accurately reflected. With more accurate projections, stakeholders will have more confidence in the economics sections of the EIS's. More accurate projections may be used in decisions regarding post-lease mitigation.

Date Information Required: The model will be used for post-lease NEPA documentation Beaufort Sea Lease Sales in 2003, 2005, and 2008, and DPP's.

Revised date: September 2003

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2004

Region: Alaska

Planning Areas: Beaufort Sea, Chukchi Sea, Hope Basin

Type: Contract

Title: Collection of Traditional Knowledge of the Alaskan North Slope

Actual Costs (in thousands):

Period of Performance: FY 1997-2004

FY1997 \$142

FY1998 \$110

FY1999 \$120

FY2000 \$44

Total Cost: \$416

Conducting Organization: Ukpiagvik Inupiat Corporation

Description:

Background The Native people of Arctic Alaska have many years of experience in living in Arctic environments and have much knowledge on the biological and physical environment of both the marine and terrestrial ecosystems. Much of this knowledge has been passed on from one generation to the next by word of mouth. Little of it is in published form and even less is indexed. Much traditional knowledge has, however, been written, audio-recorded, archived and, in some cases, published. But because there is no index of this traditional knowledge, it is often not available to the scientific community.

Objectives

1. Locate, collect and organize all “traditional-knowledge” information associated with the Alaska North Slope Borough (NSB). These encompass oral-history-taped interviews, written transcripts, published sources, and textual and video records. An important source is CD ROM “jukeboxes” produced for the NSB by the Alaska Oral History Project at the University of Alaska-Fairbanks (UAF) of elder interviews and Elders’ Conferences.
2. Identify key traditional-knowledge indices for structuring and abstracting.
3. Prepare a PC-based CD-ROM containing an annotated bibliography, abstracts, traditional knowledge indices and findings of this study.
4. Prepare an epistemology for the traditional knowledge documented in this project.

Methods Identified traditional-knowledge sources will be judged appropriate for inclusion in the traditional-knowledge database based on a review by community elders, subsistence

coordinators on staff with the NSB, Inupiaq Language and Cultural Center personnel, Inuit Circumpolar Conference, and members of the North Slope Scientific Committee. The identified information will be indexed and, with an annotated bibliography and abstracts, placed on a CD-ROM. The CD-ROM will be disseminated to Native communities and State of Alaska, Federal, and local governments involved in environmental research and assessment. At a minimum, the proposed database will encompass subsistence areas; harvest methods; relationships between physical environment and animal populations and behavior; bowhead whale behavior, movement, and distribution; ice conditions and movement; wind patterns; current patterns; and place-name information. Quality assurance will be accomplished for all significant steps of the project

Importance to MMS Public input has very strongly recommended that MMS and other government agencies incorporate traditional Native knowledge in our documents. MMS will use the products of this study to address OCSLA requirements, assist NEPA-document preparation, prepare mitigating measures, review oil-spill-contingency plans, facilitate outreach with North Slope communities regarding the MMS program, and review and formulate offshore policy for Alaska. While this study focuses on the North Slope, the process used could serve as a prototype for a similar study in all areas of Alaska.

Date Information Required: Products will provide information for post-lease NEPA documentation for Beaufort Sea Lease Sales in 2003, 2005, and 2007, and DPP's.

Revised date: September 2003

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2004

Region: Alaska

Planning Areas: All Alaska Planning Areas

Type: Contract

Title: Publication of a Book/Synthesis on the Socioeconomic Effects of Oil and Gas Industry Activity on the Alaskan OCS

Actual Costs (in thousands):

Period of Performance: FY 1998-2004

FY1998 \$349

Total Cost: \$349

Conducting Organization: Stephen Braund & Associates

Description:

Background The Alaska OCS Region has implemented an important socioeconomic component of its overall Environmental Studies Program, resulting in the publication of more than 160 Technical Reports (TR's) addressing statewide socioeconomic study topics. Methodologies have included case studies, institutional profile analysis and analysis of secondary-source materials, modeling and econometrics analysis, and survey research. In recent years, socioeconomic studies have become more focused and issue-oriented, emphasizing the critical points between OCS development and social systems with which potential development would interact. For example, studies have collected time-series information and measures of community and regional well being as bases for social-indicators monitoring.

Considering the extent of MMS's social research in Alaska and the substantial information accumulated, a workshop examining the usability of the current research in its original forms versus the costs and benefits of further synthesis was recently conducted. In planning for the preparation of a useful resource document resulting from the workshop efforts, the workshop participants identified a tentative outline, chapter integration, and potential co-sponsors.

The level of information regarding changes in the socioeconomic environment related to OCS activities is varied—without a comprehensive formal, comparative, quantitative, and qualitative documentation of existing data, this information is of limited use to decision makers.

Objectives The objective of this study is to coordinate and prepare a peer-reviewed book/synthesis of available information about the potential socioeconomic effects of oil- and gas-industry activity on the Alaska OCS.

Methods The study will finalize the book/synthesis outline; integrate chapters; identify the author; and solicit potential co-sponsors. MMS funded studies will be the primary source of reference materials plus subsequent studies that were initiated from these findings. To be

considered as source material, the literature must be related to oil and gas activities in Alaska and peer-reviewed. The topics to be addressed will be narrowed specific to the information available through this literature search which will also serve to identify potential authors. These authors may also identify additional sources of information for synthesis.

Importance to MMS Throughout Alaskan coastal communities there are socioeconomic-related issues resulting from those who favor resource development and those who want no risk of resource development. This study will provide a peer-reviewed synthesis of current information for use in decision making. The MMS foresees using the products of this study to assist NEPA-document preparation, prepare mitigating measures, review oil-spill-contingency plans, outreach with coastal communities regarding the MMS program, and review and formulate offshore policy for Alaska.

Date Information Required: The study will provide information for post-lease NEPA documentation for Beaufort Sea Lease Sales in 2003, 2005, and 2008, Cook Inlet Lease Sales in 2004 and 2006, Chukchi/Hope Lease Sale in 2008, DPP's, ongoing outreach efforts, and future socioeconomic-study proposals.

Revised date: September 2003

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2004

Region: Alaska

Planning Areas: Beaufort Sea

Type: Competitive

Title: Quantitative Description of Potential Impacts of OCS Activities on Bowhead Whale Hunting and Subsistence Activities in the Beaufort Sea

Actual Cost (in thousands):

Period of Performance: FY 2001-2004

FY 2001 \$212

FY 2002 \$347

Total Cost: \$559

Organization Conducting: EDAW, Inc.

Description:

Background The residents of Nuiqsut, Kaktovik, and Barrow are close to the oil industry activity onshore on the North Slope and in the adjoining Beaufort Sea. Subsistence is central to the Inupiat people residing on the North Slope. Virtually all Inupiat residents rely on subsistence resources directly or through kinship sharing. Bowhead whaling is especially important and impacted if OCS activity causes reduction in whale hunting success. Inupiat leaders, including elders, have expressed concern about the effects of potential oil spills on bowhead whaling and cumulative impacts of past, present and future oil industry activity onshore and offshore. At a meeting in Barrow in March 2000 elders defined two principal questions concerning cultural, social and economic impacts:

- A. Regarding offshore oil and gas activities, do people in Barrow, Nuiqsut and Kaktovik feel that these activities have: a) resulted in positive social, economic or cultural impacts to their community, and/or b) resulted in negative social, economic or cultural impacts to their community?
- If members of a community feel there have been positive social, economic or cultural impacts to their community, what are the positive impacts and how can they be quantified?
 - If members of a community feel that there have been negative social, economic or cultural impacts to their community, what are the negative impacts and how can they be quantified?
- B. What kind of support would need to be put in place to enable Alaskan Eskimo subsistence communities to continue subsistence activities and keep traditional subsistence ways of life intact in the event of an oil spill or cumulative impacts

(including air and/or water pollution and noise) that make subsistence resources locally unavailable?

Several studies have been done which address certain aspects of potential sociocultural impacts on the North Slope. This study would update some older studies and provide information not previously collected in other aspects.

Objectives To quantitatively estimate the social and cultural impacts of OCS oil and gas exploration, development, and production in the Beaufort Sea on the communities of Nuiqsut, Kaktovik, and Barrow; and to recommend mitigation measures.

1. Identify what people observe and anticipate as the positive impacts and opportunities of OCS activities.
2. Identify what people observe and anticipate as the negative impacts and risks of OCS activities.
3. Quantitatively describe direct impact experiences and anticipated experiences by bowhead hunters.
4. Document actual experiences and match the impact with the reporting unit experiencing the impact (e.g., whaling crews, households, individual hunters, elders).

Methods

1. Review the literature, including previous testimony, and make a preliminary list of North Slope impacts and concerns expressed by residents (positive and negative). Review the methodologies and survey questionnaires used in the social indicator studies conducted by MMS in the 1990's for possible use in this study. Gather a thorough list of residents' observed and anticipated impacts and concerns through focus group meetings in Nuiqsut, Kaktovik, and Barrow. Potential impacts would likely include, among others, pollution, noise, and other factors that may make bowhead whales and other marine resources more difficult to hunt or unavailable. Collect information on residents' views of possible remedies or mitigation measures related to those concerns and impacts. Design the list of impacts in such a way as to separate OCS-related impacts from other impacts as much as possible. Circulate this list of impacts and mitigation possibilities to the NSB, AEW, village contacts as appropriate, and MMS.
2. Use the literature and focus group data to develop a draft questionnaire. Distribute that questionnaire to the NSB, AEW, SRB, village contacts, and MMS for review and comment. Pretest the questionnaire (N<10) in the communities, make revisions as appropriate, and re-circulate the questionnaire for final review. Obtain approval from the Federal Office of Management and Budget (OMB) as required for federally funded questionnaires, estimated to take 6-8 months. Develop interviewer guides (question by question, tracking, and reporting procedures) and conduct an interviewer training session.

3. Coordinate with NSB, AEWC, and community contacts to enable face-to-face interviews in Barrow, Nuiqsut, and Kaktovik. Due to its large size and socio-demographic heterogeneity, use a stratified, representative, and randomized sampling strategy in Barrow. Attempt to interview randomly selected adult members in all households in Nuiqsut and Kaktovik, with the expectation of a response rate of over 80 percent. Select a subsistence-oriented Arctic or sub-Arctic control community outside of the North Slope and conduct a representative and randomized sample of interviews there. Ideally, members of the control community will hunt bowhead whales.
4. Code the surveys, enter data into SPSS (or equivalent statistical package), check, and edit. Use basic univariate and bivariate analyses to generate valid and reliable descriptive information for inclusion in summary tables and graphs, and to provide quantitative-oriented but readily understandable descriptive discussion in the draft and final reports. Use multivariate analysis to explain variation in the data and to provide quantitative-oriented but readily understandable explanatory discussion in the draft and final reports. Draw from findings about respondent's ideas for potential mitigation measures to develop a draft recommendation section.
5. Develop a draft report and present it to the AEWC, NSB, SRB, and village contacts in Nuiqsut and Kaktovik for extensive input and commentary.
6. Finalize the draft report based on the input and commentary of interested parties and present and disseminate study findings to those parties.
7. Coordinate all steps above with other potential planned studies.

Importance to MMS MMS will use the products of this study to address OCSLA requirements, assist NEPA-document preparation, prepare mitigating measures, review oil-spill-contingency plans, and in other environmental assessment and mitigation activities. Leaders of the North Slope Inupiat communities, including elders, have for many years expressed concern about potential impacts to their subsistence way of life. This study is important in its capacity to effectively measure and document such concerns and for its potential utility in future decision-making processes.

Date Information Required: This information is needed for post-lease NEPA documentation for Beaufort Sea Lease Sales in 2003, 2005, and 2007, DPP's, and formulation of mitigation measures.

Revised date: September 2003

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ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2004

Region: Alaska
Planning Areas: Beaufort Sea
Type: Competitive/Possible Joint Funding
Title: Subsistence Mapping at Nuiqsut, Kaktovik, Barrow, and Wainwright: Past and Present Comparison

Actual Costs (in thousands): **Period of Performance:** FY 2002-2004
FY 2002 \$189
FY 2003 \$211
Total Cost: \$400

Conduction Organization: Stephen A. Braund and Associates

Description:

Background MMS conducted studies providing detailed mapping of a wide range of subsistence activities for Nuiqsut, Kaktovik, and Barrow about 1990. Information is available from recent subsistence scientific, private, and government sources. For example, Alaska Department of Fish and Game (ADF&G) has done some detailed mapping of subsistence activities for these three North Slope s villages since 1990 but the mapping needs to be put in usable form. MMS assesses cumulative effects in EIS's and, therefore, needs documentation on more current subsistence patterns for comparison between 1990 and the present. Exploration on the offshore, including the OCS, and much onshore development has taken place since 1990. Much oil and gas infrastructure has been built onshore since 1990. Northstar is the first offshore oil development connecting to the onshore developments centered at Prudhoe Bay and it began production in 2001. The Liberty development, if approved, would be the first on the Beaufort Sea OCS. In general, exploration and development activities have directly affected Nuiqsut most significantly, followed by Kaktovik and then Barrow. This study will coordinate with the documentation of subsistence activities at Cross Island, which is part of the ongoing "Arctic Nearshore Impact Monitoring In Development Areas" (ANIMIDA) study and continuation of that study. It may utilize information from the ongoing study titled "Reference Manual and GIS Overlays of Oil-Industry and Other Human Activities (1979-1998) in the Beaufort Sea."

Objective Develop a Geographic Information System (GIS) to map and analyze changes in and potential interactions between subsistence activities and oil industry activities.

Methods

1. Consult with key organizations to refine the scope of work for the study and to plan for conduct of the study. Such organizations may include the North Slope Borough Planning and Wildlife Management Departments, Alaska Eskimo Whaling Commission (AEWC), Inupiat Community of the Arctic Slope, the Native Villages of Barrow, Nuiqsut and

Kaktovik, and ADF&G Subsistence Division, and others as appropriate

2. Compile information regarding subsistence geospatial patterns from MMS sponsored and other studies conducted in Nuiqsut, Kaktovik, Barrow and Wainwright during the 1990s. Assess the quality of existing geo-spatial data and convert to GIS format where possible. Include data from the ADF&G Individual Harvest-Area Maps and Key Informant Mapping Project completed for MMS.
3. Compile current information on subsistence activities and use of resources for Nuiqsut, Kaktovik, Barrow, and Wainwright as available from recent work conducted by scientific, private, and government entities. Gather primary source data regarding current subsistence effort, and use of resources from knowledgeable key informants resident in Nuiqsut, Kaktovik, and Barrow. These data may be acquired through scoping meetings, focus groups, and in-person interviews. The data collection effort will coordinate with other MMS studies such as “Quantitative Description of Potential Impacts of OCS Activities on Bowhead Whale Hunting and Subsistence Activities in the Beaufort Sea,” and the “Traditional Knowledge/Western Science Bowhead Whale Seasonal Migration Report.”
4. Generate maps depicting where subsistence activities are currently taking place and at what level of intensity. Products will show potential changes in:
 - Harvests
 - Access to resources
 - Competition for resources
 - Costs
 - Effort
 - Levels of risk
5. For each subsistence activity map, provide context describing in standardized and specific terms the nature and source of the data
6. Illustrate on maps the location, nature of, and changes onshore and offshore oil industry infrastructure for 1990, a mid-point year, and the most current year. Depict exploration activity, including seismic exploration and drilling by year since 1990 to the present.
7. Develop overlay maps depicting changes in subsistence activities and changes in oil and gas activities. Develop analysis to address potential cumulative-effect dynamics occurring between subsistence and oil and gas activities. Develop descriptive context to augment the analysis.
8. Review and evaluate effectiveness of current federal and state mitigation associated with oil and gas activity regarding potential displacement of subsistence resources and resource users.
9. Review graphic and written analysis with key informants and key organizations including but not limited to those identified in 1 above. Disseminate ongoing and final products of study to local residents through village workshops and integrate workshop feedback into the final analysis.
10. Input all final spatial information on subsistence and industry activity into a Geographical Information System.

11. Make resulting information available to the public on CD-ROM.

Importance to MMS MMS will use the products of this study to address OCSLA requirements, assist NEPA-document preparation, prepare mitigating measures, review oil-spill-contingency plans, facilitate outreach with North Slope communities regarding the MMS program, and review and formulate offshore policy for Alaska.

Date Information Required: The information is needed for post-lease NEPA documentation for Beaufort Sea Lease Sales in 2003, 2005, and 2007, and DPP's.

Revised date: September 2003

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ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2004

Region: Alaska

Planning Areas: Beaufort and Chukchi Seas and Hope Basin

Type: Competitive

Title: North Slope Borough Economy, 1965 to Present

Actual Costs (in thousands):

Period of Performance: FY 2003-2004

FY 2002 \$99

Total Cost: \$99

Conducting Organization: Northern Economics, Inc.

Description:

Background The focus of the social and economic studies of the MMS Alaska OCS Region has been the potential for increase in offshore oil and gas activity. Many MMS socioeconomic studies were based on scenarios of change from no-industry activity to development-stage activity. However, through 1999, industry activities in all Alaska OCS leased areas had gone only to the exploratory phase, and industry activities onshore in Alaska currently are in decline. Although there was much greater production in the 1980's, reduced production at Prudhoe Bay fields in the 1990's and attractive international exploration and development opportunities are additional factors affecting property tax revenues to the North Slope Borough (NSB). This historical economic activity and its effect on NSB revenues/expenditures, provides a context for anticipated offshore development and production at Northstar and, if approved, Liberty and their potential effect on regional and local economies. A descriptive characterization of historic and recent North Slope economic activity due to onshore activities is necessary in order to evaluate relative significance of projected offshore development. The anticipated decline in oil production may be offset to a degree by production of natural gas from Prudhoe Bay and surrounding fields. The major oil and gas companies are seriously considering natural gas production as of the year 2001. This could increase the NSB revenues.

Objectives

1. Describe revenues and expenditures of the NSB, 1965 to the most current year available.
2. Portray how the NSB, as the local government, and individuals and households anticipate dealing with decline in revenues from the oil industry.
3. Describe the structure of NSB economy and changes to the structure, 1965 to the most current year available.
4. Describe the role of the regional Native corporation in the economy.

5. Provide a comparative basis for assessing potential economic effects of upcoming offshore oil and gas activity.

Methods

1. Make a quantitative and narrative description of NSB revenues and expenditures for each year from 1965 through the most current year available for capital projects. Classify local government services by departments of the NSB and other major categories.
2. Using the institutional profile analysis method focusing on key informants, describe how the NSB, as the local government, anticipates responding to a decline in revenue.
3. Also using key informants, describe how individuals and households anticipate responding to a possible economic change, such as doing more subsistence hunting or moving to areas in Alaska where cash jobs are available. Focus on the family (households), personal income, and sources of income for the families.
4. Using data from the NSB and State Department of Labor, describe the structure of the NSB economy and changes, 1965 to the most current year; i.e., employment by sector of the economy and employer. Analyze local jobs and the types of jobs. Describe the flexibility of jobs in relation to subsistence (for example, getting time off to engage in subsistence. Using the best data available, describe in- and out-migration).
5. Describe the role of the regional Native corporation, Arctic Slope Regional Corporation, in the North Slope Borough economy. Depict its role both in quantitative and narrative form.
6. Coordinate the study with NSB officials, as needed.

Importance to MMS This study will be useful to MMS in assessing potential economic impacts of OCS development activity on the NSB and NSB residents with respect to revenues and expenditures, employment, subsistence and migration. It will provide a region-wide perspective of the economic effects of recent on-shore oil and gas development against which upcoming OCS economic effects may be gauged.

Date Information Required: This information will be used for post-lease NEPA documentation for Beaufort Sea Lease Sales in 2003, 2005, and 2007, and DPP's.

Revised date: September 2003

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2004

Region: Alaska

Planning Areas: All

Type: Competitive

Title: Social and Economic Assessment of Major Oil Spill Litigation Settlement

Actual Costs (in thousands): **Period of Performance:** FY 2003-2005
FY 2003: In Procurement, TBD

Description:

Background Major oil spills such as the 1978 Amoco Cadiz and 1989 *Exxon Valdez* (EVOS) events led to a variety of documented social and economic effects. But spill-related litigation and settlement processes and their effects have not been a common topic of socioeconomic research. Regarding EVOS, social scientists speculate that final settlement and distribution of award monies will lead to various beneficial and detrimental secondary effects in addition to those related to the original spill and cleanup events and subsequent phases of litigation. The nature and intensity of such effects hypothetically relate to socioeconomic, demographic, and other attributes of recipients, and to the nature of experience with the spill and litigation.

A recently completed MMS study “Exxon Valdez Oil Spill, Cleanup, and Litigation: A collection of social impacts information and analysis” (MMS OCS Study 2001-085) provides a comprehensive qualitative overview of general information which will provide useful background to the present quantitative effort.

Objectives Analyses of data collected in spill-affected communities soon after the EVOS event report that existing social problems were heightened in relation to the influx of spill clean-up monies and resources, particularly in rural-Native communities where access to subsistence resources was limited. Subsequent analyses suggest that larger communities have benefited from opportunities such as eco-tourism that were not extant before the spill. It may be hypothesized that spill clean-up and restoration monies and resources served to amplify social, demographic, and economic trends and attributes of the awardees in all cases at individual, familial, and community levels of analysis. The objective of this study is to test this hypothesis given potential future influx of monies and resources via final litigation settlement.

Methods The study will require compilation and analysis of existing data, collection of new pertinent information, coordination with similar research conducted in the region, detailed comparative analysis, and development of summary conclusions. The methods are:

1. Compile and summarize existing data and scholarship regarding pre- and post-EVOS socio-

economic conditions and trends on Kodiak Island. Continue to monitor annually updated public access data for changes in demographic trends throughout the study period.

2. Secure ethnographic research access from appropriate local authorities in two different Kodiak village communities. Also secure ethnographic research access to the City of Kodiak.
3. Conduct ethnographic fieldwork in all three Kodiak locations. The fieldwork will involve community level participant-observation in relevant public forums, as well as open ended conversations with a sample of community households in each location from different levels of socioeconomic strata. The fieldwork is intended to gather information about potential changes in key socioeconomic indicators such as: residency and migration patterns, occupational profiles, patterns of investment and return, specialization vs. diversification in commercial fishing operations, specialization vs. diversification in traditional subsistence activities, and other selected social practices.
4. Conduct focus-group forums in all three fieldwork locations to supplement and compare with insights gained from step 3 above. It is expected that different community-level concerns and issues relevant to the litigation settlement process will surface in a focus-group forum that go unexpressed at household level conversations.
5. Analyze the various data compiled above to develop a descriptive comparative analysis of the interim socioeconomic effects and expectations of the litigation experience in each community under investigation. Report the findings at the end of project Phase One (prior to final spill litigation settlement/award distribution).
6. After a final litigation settlement is reached, conduct a second round of fieldwork to gather comparable data for the same categories of variables from all three communities. Analyze the data and report the findings at the end of project Phase Two (some months after the final distribution of settlement awards).
7. Produce a detailed written summary analysis that is responsive to the original hypothesis of the project. Report on major insights and general recommendations relevant to the effective management of future potential oil spills and related litigation and settlement.

Importance to MMS The potential social costs of major coastal oil spills are a public concern associated with OCS development in the U.S. Insofar as the effects of EVOS continue to frame community response to oil and gas development, comprehensive understanding of the event and its various effects are of importance to MMS Alaska OCS Region. This study will generate analysis of utility for EA and EIS documentation, and an empirically-based framework for predicting and mitigating social effects potentially resulting from major oil spills and resulting oil spill litigation.

Date Information Required: This information is needed for NEPA post-lease documentation for proposed Beaufort Sea Lease Sales in 2003, 2005, and 2007; Cook Inlet Lease Sales in 2004 and 2006; Chukchi/Hope Basin Lease Sale in 2007; and review of exploration, development and production plans.

Revised date: September 2003

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2004

Region: Alaska

Planning Areas: Cook Inlet/Shelikof Strait

Type: Competitive

Title: Mitigation of Industry Operations on Drift Net Fishing

Actual Costs (in thousands):

Period of Performance: FY 2003-2004

FY 2003: \$175

Total Cost: \$175

Conducting Organization: Impact Assessment Inc.

Description:

Background Drift net fishermen have expressed a concern about their nets getting caught on oil rigs or the loss of harvest resulting premature release when the drift is toward a permanent facility. A previous study partially addressed this issue: "Mapping Cook Inlet Rip Tides Using Local Knowledge and Remote Sensing" (OCS Study MMS 2000-025). That study mapped rip tides, provided statistics on consistency of rip tide locations, and provided an information base on fishermen's use of rip tides. According to MMS 2000-025 "avoiding fixed objects while drifting with a long net up to 270-m long is difficult given the distance a boat may float while hauling up a net. For example, fishermen reported taking 15 minutes to pull in an empty net, if nothing goes wrong. During this time, a boat and gear might travel 1 nm, given a conservative current of 4 knots. Consequently, avoiding stationary objects in Cook Inlet is difficult during an active fishing operation."

Given the dynamic interaction of fishing regulations, weather, tides, and fishing technology, specific methods to mitigate concerns and/or future conflicts remain and could pose potential delay to MMS leasing goals.

Objectives

Identify methods to mitigate potential for drift nets entangling on oil rigs in Cook Inlet or the loss of harvest resulting in premature release when the drift is toward a permanent facility.

Methods

1. Synthesize information from OCS Study MMS 2000-025 and other sources.
2. Do literature search to find mitigation of such conflict in other places in the world.
3. Consult with fishermen and oil and gas industry personnel to define mitigation methods.

4. Analyze economic tradeoffs of alternative potential mitigation measures.
5. Analyze structure of changes of the commercial fishing industry and account for these with respect to potential mitigation measures.
6. Examine whether existing service bases would be used or addition infrastructure would be built. If alternative sites need to be developed, examine the potential of creating social impacts.

Importance to MMS MMS is responsible for identifying and mitigating potential environmental effects of OCS development to fish resources. Formulating effective mitigation measures will help resolve an important stakeholder concern. Mitigation measures from this study should mitigate potential effects from of OCS activity in Cook Inlet. They will contribute to NEPA documentation for potential exploration, development and production associated with the proposed Cook Inlet Lease Sales in 2004 and 2006 and existing leases from Sale 149.

Date Information Required: For post-lease NEPA documentation for Cook Inlet Lease Sales in 2004 and 2006, and DPP's.

Revised date: September 2003

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2004

Region: Alaska
Planning Area: Beaufort Sea
Type: Competitive
Title: ANIMIDA - Arctic Nearshore Impact Monitoring in Development Area

Estimated Costs (in thousands):	Period of Performance: FY 1999-2004
FY1999 \$517	
FY2000 \$832	
FY2001 \$818	
FY2002 \$750	
FY2003 \$300	
Total Cost: \$3,217	

Conducting Organization: Arthur D. Little, Inc.

Description:

Background Scientists, environmental groups, state and federal agencies and local residents are particularly concerned about long term effects of offshore developments at Liberty and Northstar as well as long term effects of any development from Lease Sale 170. Interagency reviews of related EIS's and Development and Production Plans recommend monitoring impacts of Northstar and, if approved, Liberty. Current information on selected topics is available but likely to be out of date or not of sufficient geographic or seasonal focus to meet the needs of this effort.

This study gathers long term monitoring data which will provide a basis of continuity and consistency in evaluation of potential impacts from site-specific, recently initiated development and upcoming production in the Beaufort Sea. Priority monitoring issues have been established through public and interagency comment, and coordinated with lessees and other organizations.

Objectives Due to the scale and scope of this study, the objectives were phased.

Phase I: Environmental Baselines:

- Review of recent literature for Liberty and Northstar areas
- Underwater/air noise and vibration
- Sediment quality
- Resuspension/deposition

Phase II:

- Task Order (TO) 1: Core Contractor Program Management, Logistics, Database and Reporting.
- TO 2: Hydrocarbon and Metal Characterization of Sediments, Bivalves and Amphipods in the ANIMIDA Study Area.
- TO 4: Annual Assessment of Subsistence Whaling Near Cross Island.

- TO 5: Sources, Concentrations, and Dispersion Pathways for Suspended Sediment in Areas of Oil and Gas Development along the Coastal Beaufort Sea.
- TO 6: Monitoring the Boulder Patch as Part of the ANIMIDA Program Phase II.
- TO 7: Partitioning of Potential Contaminants between Dissolved and Particulate Phases in Waters of the Coastal Beaufort Sea.
- TO 8: Baseline Characterization of anthropogenic Contaminants in Biota Associated with Alaska OCS Liberty and Northstar Oil and Gas Production Units in the Nearshore Beaufort Sea.

Methods Phase I, included focused literature review, planning, and pre-Northstar/Liberty-construction baseline effort focused on key physical environmental factors, including trace metal and hydrocarbon chemistry. Field logistics for both phases included helicopter support and small vessel (e.g. MMS Launch 1273) support in the “open” water season and snow machine support in winter/spring. Phase II (FY’s 2000-2003) included monitoring of Northstar construction and baseline effort for Liberty. The Phase II sediment sampling focused on the recently completed Northstar Island and pipeline. Source samples were collected from construction gravel pits, artificial islands, rivers, and barrier islands and sediment from 42 offshore stations (old Beaufort Sediment Monitoring Program, Northstar, Northstar pipeline, and Liberty sites). Turbidity, total suspended sediment, current velocity measurements were made in the vicinity of Northstar construction, spoils dumps and other sites including local rivers. Sediment and suspended sediment samples were analyzed for PAH, trace metals, and supporting chemistry. Contaminant sampling of biota emphasized fish. These were analyzed for hydrocarbons, persistent organic pollutants, and trace metals. Kelp productivity was monitored in the Boulder Patch starting in 2001 and used the inherent optical properties of the ice and water to estimate the impact of sediment resuspension on kelp productivity. Optical-related measurements included spectral irradiance, light scattering coefficients, and total suspended solids. An experienced Arctic rural sociologist was stationed on Cross Island during the whaling season and recorded the information on whaling locations, success, and whaler perceptions during 2001-2003. Year 5 (FY 2003) is primarily devoted to reporting of monitoring results.

Importance to MMS Northstar construction started during Phase I. Liberty, if approved, could start construction in 2003, with the EIS currently being written by the Alaska OCS Region. Development of these Units is generating public concerns regarding impacts on nearshore biota and environment.

Date Information Required: There is a continuing, ongoing need for this information during the performance period of the study and for monitoring potential effects Northstar and Liberty, if approved and developed.

Revised date: September 2003

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2004

Region: Alaska
Planning Areas: Beaufort Sea
Type: Competitive or Contract Modification
Title: Continuation of Arctic Nearshore Impact Monitoring in Development Area (cANIMIDA)

Actual Costs (in thousands): **Period of Performance:** FY 2003-2008
FY 2003: In Procurement, TBD

Description:

Background The Arctic Nearshore Impact Monitoring in Development Area (ANIMIDA), a five-year study started in 1999, has provided baseline data and monitoring results for chemical contamination, turbidity, and subsistence whaling in the vicinity of Northstar and Liberty development sites. Northstar is in State waters, but includes production of some OCS oil through directional drilling. Liberty, if approved, will be the first offshore OCS development project in the Beaufort Sea or elsewhere in the Alaska OCS. ANIMIDA monitoring for Northstar includes pre-construction, and construction, and early production periods. The last field sampling for ANIMIDA is scheduled for spring 2003. This proposed study would begin thereafter, with an initial planning phase funded and procured under FY 03 appropriations.

Objectives This study will gather long term monitoring data which will provide a basis of continuity and consistency in evaluation of potential effects from site-specific, recently initiated development and upcoming production in the Beaufort Sea OCS. Currently, these site-specific areas include the Northstar and Liberty areas, other prospects would be included if proposed for development. Priority monitoring issues will be established through public and interagency comment, and coordinated with lessees and other organizations. At minimum, we expect cANIMIDA to continue the following ANIMIDA objectives:

1. Hydrocarbon and metal characterization of sediments, bivalves and amphipods in the study area.
2. Annual assessment of subsistence whaling near Cross Island.
3. Sources, concentrations, and dispersion pathways for suspended sediment.
4. Monitoring the Boulder Patch.
5. Characterization of anthropogenic contaminants in upper tropic biota.

Methods Field logistics for both phases include helicopter support and small vessel (e.g. MMS Launch 1273) support in the “open” water season and snow machine/rolligon support in winter/spring. Samples will be collected from construction gravel pits, artificial islands, rivers, barrier islands, and sediment from ANIMIDA offshore stations and along the proposed Liberty pipeline route.

Turbidity, total suspended sediment, current velocity measurements are being made in the vicinity of construction, spoils dumps and other sites including local rivers and the Boulder Patch. Sediment and suspended sediment samples will be analyzed for PAH, trace metals, and supporting chemistry using methods consistent with prior ANIMIDA analyses. Biota sampling (species and contaminants measured) will be based on results and recommendations from ANIMIDA. Kelp productivity will be monitored in the Boulder Patch and will use the inherent optical properties of the ice and water to evaluate the effect of sediment resuspension on kelp productivity. Optical-related measurements will include spectral irradiance, light scattering coefficients, and total suspended solids. The reporting program for Cross Island whaling, which records information on whaling locations, success, and whaler perceptions, will be supported. Field programs will be scheduled in 2003-2006. Year 5 (FY2007) will be devoted to reporting of monitoring results.

Importance to MMS Northstar construction started during the ANIMIDA study and production started in November 2001. Liberty, if approved, could start construction sometime during the period of cANIMIDA. Development of these Units is generating public concerns regarding effects on nearshore biota and environment. Interagency reviews of related EIS's and Development and Production Plans recommend monitoring effects of Northstar and the possible Liberty development.

Date Information Required: There is a continuing, ongoing need for this monitoring information during the performance period of the study, which will coincide with production from Northstar and possible Liberty construction, if approved.

Revised date: September 2003

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2004

Region: Alaska
Planning Areas: Chukchi Sea, Hope Basin, Norton Sound, Cook Inlet
Type: Competitive
Title: Update of Environmental Information for Cook Inlet, Chukchi/Hope Basin and Norton Basin Planning Areas

Actual Costs (in thousands): **Period of Performance:** FY 2003-2004
FY 2003 In Procurement, TBD

Description:

Background In the *Final Proposed Outer Continental Shelf Oil and Gas Leasing Program 2002-2007* (September 2002), the MMS proposes lease sales in Cook Inlet, Chukchi/Hope Basin and the Norton Basin Planning Area. Since it has been several years, or longer, since EIS's were written to describe potential developments in those areas, MMS literature reviews are now somewhat out of date. Updated literature surveys would potentially benefit MMS analysts, representatives of other agencies and organizations and the general public in efforts to evaluate the effects of proposals to develop OCS oil and gas in the above planning areas.

Objectives Make available new scientific information on the biology and status of important vertebrate species for easy access by MMS analysts, representatives of other agencies and organizations and the general public.

Methods Conduct a literature survey and prepare an annotated bibliography of new scientific information (past 5-10 years, depending on area) on fish, marine mammals, marine birds, ecosystems, and human social systems that might be affected by oil and gas development in the OCS. Potential sources of information include, but are not limited to:

1. Primary scientific literature and books.
2. Unpublished reports, analyses, and other accessible documents.
3. Other sources such as internet homepages and accessible data bases.

These objectives will be accomplished in coordination with other ongoing studies, as appropriate, to avoid duplication.

Importance to MMS Annotated bibliographies will be useful to MMS analysts for purposes of evaluating the effects of OCS oil and gas developments. They will also help inform individuals from other organizations and the general public about the current status of the Alaska OCS human, marine, and coastal environment, and thereby facilitate the EIS review process.

Date Information Required: Bibliographies are needed for EIS's for post-lease NEPA documentation for Cook Inlet Lease Sales in 2004 and 2006, Chukchi/Hope Basin Lease Sales in 2004 and 2007, and Norton Planning Area Lease Sales between 2003 and 2007, depending on nominations received.

Revised date: September 2003

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2004

Region: Alaska

Planning Areas: Beaufort Sea

Type: Competitive

Title: Beaufort Sea and North Slope Pipeline GIS Database

Actual Costs (in thousands):

Period of Performance: FY 2002-2004

FY 2002 \$78

Total Cost: \$78

Conducting Organization: Michael Baker, Jr. Inc.

Description:

Background The MMS has primarily used the historical spill record on the Outer Continental Shelf (OCS) as an indicator of future spill occurrence rates on the OCS. This spill record does not include pipeline spills shoreward of the OCS, in State waters, or on land. The MMS intends to calculate spill rate occurrence based on Regional considerations, such as the Alaska North Slope production and pipeline experience, and to include all major pipeline spills, both onshore and offshore in environmental impact assessment. The first step in this process was a prior study (OCS Study MMS 2000-007) in FY 1999-2000 to collate available information on oil spills of at least 100 barrels (bbl) and to provide preliminary evaluation of spill occurrence rates.

One objective of this prior study that could not be accomplished was to evaluate usefulness of pipeline length as predictor or co-predictor (with pipeline throughput) for North Slope and Trans-Alaska Pipeline System (TAPS) spillage. This objective required concomitant pipeline segment throughput and pipeline segment length information at yearly or better intervals. The prior study did not have the available resources to collect the comprehensive data on field gathering lines necessary to complete the analysis. Construction of a database of that information base was beyond the scope of that study.

Objectives This study is in two Phases. Phase II will not be funded unless significant information is deemed obtainable through the efforts of Phase I.

Phase I:

1. Establish how much of the construction history (length, location) and throughput history can be reconstructed from industry, government, mapping and/or other sources. Include onshore North Slope, offshore Beaufort, and TAPS pipelines.
2. Establish whether supporting information on pipeline segment characteristics (diameter, special protective measures, inspection measures, special spill detection measures, etc) can be obtained.

3. Develop a written plan for obtaining these data and placing them in a Geographical Information System (GIS) database.

Phase II:

1. Implement the strategy developed in Phase I to obtain pipeline data.
2. Develop GIS database.

Methods

Phase I:

1. Establish potential data sources and develop communications links.
2. Establish inventory of data and data sources.
3. Establish contacts for all known data sources.
4. Establish cooperative agreements with major potential users of the data.
5. Provide written permission to access the data.
6. Develop written plan for obtaining data and constructing GIS database.

Phase II:

1. Implement strategy for obtaining data.
2. Implement strategy for constructing GIS database:
 - Consistent with the MMS corporate database structure.
 - Capable of point and click identification of specific pipeline segments and characteristics.
 - Capable of display of existent pipeline by year.

Importance to MMS The Oil-Spill-Risk Analysis (OSRA) is a cornerstone to regional EIS's environmental assessments, and oil-spill-contingency planning. Oil-spill issues constitute a significant portion of public comments submitted on sale or development EIS's in the Alaska OCS Region. This information also provides a corner stone for analyzing the spatial extent of cumulative impacts of oil pipeline development through time.

Date Information Required: MMS will use the information from this study in preparing post-lease NEPA documentation for Beaufort Sea Lease Sales in 2003, 2005, and 2007, DPP's, and in reviewing oil-spill-contingency plans.

Revised date: September 2003

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2004

Region: Alaska
Planning Area: Beaufort Sea
Type: Competitive
Title: Determining Archaeological Potential of Buried Terrestrial Landforms in the Beaufort Sea: Phase I

Actual Cost: (in thousands): **Period of Performance:** FY 2003-2005
FY 2003 In Procurement, TBD

Description:

Background The MMS is required under the National Historic Preservation Act to evaluate the potential effects of our permitted activities on significant archaeological resources. To fulfill this requirement, the MMS has developed an archaeological resources protection program that requires review of geological and geophysical data within OCS lease areas to identify specific locations having potential for preserved prehistoric archaeological site deposits. Existing terrestrial archaeological data indicate that relict landforms such as paleo-channels, stream terraces, point bar deposits, lakes, and lagoons dating from the last glacial advance/low sea stand (i.e. late Wisconsinan) are locations where preserved archaeological deposits are most likely to occur. Recent geophysical data collected from OCS lease areas in the Beaufort Sea indicate the presence of these types of relict landforms at and just beneath the seafloor shoreward of the 20-meter isobath where winter shorefast floating ice protects the seafloor from large pack ice incursions and ice gouging. There are presently insufficient data to evaluate whether these landforms date from the late Wisconsinan low sea stand (ca. 19,000 to 3,000 B.P.) in which case they would have potential for preserved archaeological deposits, or from an earlier period of low sea stand, in which case they would not have archaeological potential.

Objectives The objective of this study is to evaluate whether the relict terrestrial landforms observed at, and just beneath the seafloor, in the Beaufort Sea date from the late Wisconsinan or from an earlier time period. If it can be established that these features date earlier than the late Wisconsinan, the MMS would no longer require prehistoric archaeological resource analyses and associated mitigation measures (i.e. avoidance of relict features or further investigation) for leases in the Beaufort Sea. Samples and age-dates obtained through this study may also be useful in refining the relative sea level history for the Beaufort and Chukchi Seas which, in turn, may contribute to our understanding of the causes and effects of past global climate changes.

Methods

This study is in three phases; however, the need for each subsequent phase of the study is dependent on the findings of the previous phase.

Phase I: Review of Existing Geologic and Geophysical Data and Analysis of Existing Cores

1. Perform thorough review of existing geologic and geophysical data contained in published studies and reports for the Beaufort Sea including reports and data from industry drill site and pipeline clearance surveys, and the data compiled in OCS Study MMS 2002-017.
2. Map areas containing drowned terrestrial landforms using OCS Study MMS 2002-017, and establish whether cores were taken in these areas.
3. Find out if cores from these surveys still exist, where they are stored, their general condition, and how they may be acquired or sampled.
4. Acquire previously drilled cores or core samples from existing Beaufort Sea industry surveys and the 1979 USGS Beaufort Sea core program in areas identified as having potential drowned terrestrial landforms.
5. Conduct laboratory analysis of samples taken from the cores associated with terrestrial landforms to extract samples for:
 - Radiocarbon or other isotopic dating techniques.
 - Paleoenvironmental analyses.
 - Archaeological analyses, if macroscopic indicators of a site such as charcoal; charred vegetal material, bone or shell; or lithic material are present.
6. Use previously acquired industry surveys and relevant USGS high-resolution seismic survey data to identify areas of potential terrestrial landforms for which sediment cores do not exist.
7. If the existing data analyzed in the Phase I study are insufficient to categorically estimate the age of the terrestrial landforms identified in existing seismic data, outline the following for the Phase II study:
 - Locations where additional high-resolution seismic lines are needed to correlate terrestrial features observed in existing seismic data.
 - Locations where additional sediment cores are needed to evaluate terrestrial features seen in existing seismic data or where they are needed to otherwise validate seismic interpretations.

Phase II: Collection and Analysis of Additional Seismic Lines and Cores

1. Collect and analyze marine high-resolution seismic profiles along transects identified in the Phase I study.
2. Collect new cores in the areas identified in the Phase I study using:
 - Vibracore and/or rotary drilling rig mounted in marine vessel or over-ice vehicle.
 - Onboard core storage and preliminary analysis.
3. Conduct laboratory analysis of collected cores to extract samples for:
 - Radiocarbon or other isotopic dating techniques.
 - Paleoenvironmental analyses.
 - Archaeological analyses (if macroscopic indicators of a site such as charcoal; charred vegetal material, bone or shell; or lithic material are present).
4. Estimate the age of observed shallow offshore terrestrial landforms and, if data are adequate, establish a new relative late Wisconsinan sea level curve for the Beaufort Sea.

Phase III: Archaeological Baseline Study for the Beaufort Sea Area

If the Phase I or Phase II studies conclude that the shallow offshore terrestrial landforms in the Beaufort Sea date from the late Wisconsinan low sea stand, the Phase III Archaeological Baseline Study will be required. The baseline study will synthesize all existing geologic, paleoenvironmental and archaeological data for the Beaufort Sea area to:

- More clearly define the relationship of prehistoric human populations to the prehistoric landscape.
- Define the size, type, and ages of sites to be anticipated in the offshore area.
- Define how site densities fall off with increasing distance from the various types of landforms.

Importance to MMS MMS permitting decisions for exploratory wells, development and production facilities and pipelines in the Beaufort Sea must include an assessment of the potential for prehistoric archaeological sites in the areas to be disturbed by the permitted activities. Recent high-resolution seismic data collected on OCS leases in the Beaufort Sea have identified relict terrestrial landforms that indicate areas where prehistoric archaeological sites may occur. In the absence of actual age-dates, the stratigraphic position of these landforms suggests they are late Wisconsinan in age, and therefore, must be avoided or investigated further prior to MMS approving any lease activities that may disturb the features. If these features are established through this study to predate the late Wisconsinan, the MMS will no longer need to require prehistoric archaeological analyses, avoidance or further investigation of these areas prior to permitting activities in the Beaufort Sea.

Date Information Required: This information is needed for post-lease NEPA documentation for proposed Beaufort Sea Lease Sales in 2003, 2004, and 2007 and for review of all existing and future exploration, development and production plans and pipeline rights-of-way in the Beaufort Sea Planning Area.

Date: September 2003

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ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2004

Region: Alaska
Planning Areas: All Alaska Planning Areas
Type: Cooperative Agreement with University of Alaska, Fairbanks
Title: Minerals Management Service/University of Alaska-Fairbanks/State of Alaska/Coastal Marine Institute - Management

Actual Costs (in thousands):	Period of Performance: FY 1998-2004
FY 1998	\$101
FY 1999	\$100
FY 2000	\$112
FY 2001	\$125
FY 2002	\$125
FY 2003	\$109
Total Cost:	\$563

Conducting Organization: CMI, UAF

Description:

Background This study provides management of a large ongoing program of scientific research into framework issues related to lease sales *Final Proposed Outer Continental Shelf Oil and Gas Leasing Program 2002-2007*, September 2002. It is a cooperative program between MMS and the University of Alaska, with State of Alaska participation. The Coastal Marine Institute (CMI) is expected to leverage additional scientific results and logistics capability at levels comparable to the MMS contribution. The Coastal Marine Institute will update and expand our understanding of OCS environmental information and address future needs related to the offshore oil and gas program in Alaska.

Objectives The purpose of the CMI is to generate scientific information for MMS and State of Alaska decision makers that is consistent with the needs outlined by the Framework Issues. The Framework Issues are:

1. Scientific studies for better understanding marine, coastal or human environments affected or potentially affected by offshore oil and gas or other mineral exploration and extraction on the Outer Continental Shelf (OCS).
2. Modeling studies of environmental, social, economic, or cultural processes related to OCS gas and oil activities in order to improve scientific predictive capabilities.
1. Experimental studies for better understanding of environmental processes, or the causes and effects of OCS activities.

2. Projects which design or establish mechanisms or protocols for sharing data or scientific information regarding marine or coastal resources or human activities in order to support prudent management of oil, gas and marine mineral resources.
3. Synthesis studies of scientific environmental or socioeconomic background information relevant to the OCS gas and oil program.

Methods A proposal process is initiated each year with a request for letters of intent to address one or more of the Framework Issues. The proposals are requested from university researchers and other scientific researchers in State agencies. A Technical Steering Committee made up of scientific representatives of the cooperators reviews letters of intent and proposals to be evaluated for possible funding. External peer reviews may be requested for new projects. Principal investigators give presentations at ITM's, scientific conferences, and various public meetings.

Importance to MMS By adopting this cooperative agreement, improved leasing decisions and EIS analyses pertinent to lease sales in the Beaufort Sea, Cook Inlet, Gulf of Alaska, and Chukchi Sea/Hope can be made. Final reports will be available for lease sales and post-sale decisions; interim data products and inputs will be used to address information needs. Topical areas to be addressed under the Coastal Marine Institute have been identified through this Annual Study Plan, previous Alaska Region study plans, and the Framework Issues. The study also will develop information that addresses public concerns raised during outreach efforts.

Date Information Required: Information products are required from 1 year to 6 months prior to proposed lease sales. Also, the information collected is required to be used in postlease decisions such as exploration plan reviews and approvals, and potential development-stage environmental impact analyses and related approvals, or in the implementation of lease-sale mitigating measures that require scientific information for implementation.

Revised date: September 2003

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2004

Region: Alaska
Planning Areas: All Alaska Planning Areas
Type: Interagency Agreement
Title: Management, Logistics, and Warehouse Storage of Oceanographic Equipment

Actual Costs (in thousands):	Period of Performance: FY 2004-2006
FY 2004 \$87	
FY 2005 \$87	
FY 2006 \$87	
Total Cost: \$251	

Conducting Organization: GSA-administered lease for warehouse and MMS for Launch 1273 and other aspects

Description:

Background The MMS, Alaska OCS Region, has responsibility for equipment management in support of Alaska studies. In 1996 the General Services Administration (GSA) obtained a new storage facility for ESP use. The equipment is stored in a small warehouse in Anchorage, where it is maintained and made available for ongoing projects. This support element also provides funds for maintenance of the MMS Alaska Region Launch 1273, a small research vessel needed for various oceanographic studies, as well as funds for other equipment maintenance and shipping.

Objectives The purpose of this program-support element is to efficiently manage and store oceanographic equipment.

Methods The GSA arranges for an appropriate warehouse facility for our use.

Launch 1273 was commissioned in 1983. MMS contractors will use it for the cANIMIDA and other oceanographic studies in the Arctic.

Importance to MMS Without funding of this program-support element, it would not be possible to maintain or deploy the 36-foot MMS Launch 1273 that provides a mobile, cost-effective, and specialized research vessel for a variety of biological and oceanographic studies throughout the coastal waters of Alaska. Costs for certain studies would increase significantly if more expensive marine-support alternatives were chartered. Additionally, it would not be possible to maintain an equipment warehouse that allows us to re-use and share equipment effectively among projects and agencies. This is a critical program-support element related to studies that

support all current leases. Funding for the next fiscal year is considered critical; the studies element cannot be deferred until the next budget period.

Current Status of Information: Not applicable.

Revised date: September 2003

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2004

Region: Alaska

Planning Areas: All Alaska Planning Areas

Type: Contract

Title: Conference Management and Reports on MMS Results

Actual Cost (in thousands):

Period of Performance: FY 2004-2006

FY 2004 \$144

FY 2005 \$132

FY 2006 \$144

Total Cost: \$420

Conducting Organization: MBC Applied Environmental Sciences

Description:

Background As discussed in Section 1 Introduction-Background of this Annual Studies Plan, the Alaska Environmental Studies Program (ESP) has organized many meetings on environmental studies information. During the past decade, the main priorities have been small workshops for resolution of environmental issues and Information Transfer Meetings (ITM's) for the exchange of studies information among Principal Investigators and the general public. In addition to the transfer of information through meetings, the ESP has transferred information through ITM proceedings, reports and publications on MMS results. The Alaska ESP has also organized small meetings on a limited range of topics called Information Update Meetings (IUM's). The Alaska ESP has also organized workshops with experts and interested parties on selected topics oriented to formulating concepts for a new study to address a study need.

Objectives The objectives are to produce ITM's, IUM's, small workshops, and publications on OCS environmental studies information.

Methods The primary method is to coordinate meetings and workshops and assist with preparation of publications. Coordination includes organizing appropriate speakers and participants and logistics.

1. Hold and report results of a workshop as described in the study profile "Surface Circulation Radar Mapping in Alaskan Coastal Waters: Planning/Feasibility Study."
2. Hold and report results of a meeting on Arctic cisco as described in Phase I of the study "Analysis of Variation in Abundance of Arctic Cisco in the Colville River."
3. Respond to future Task Orders for Information Transfer Meetings and Information Update Meetings.

Importance to MMS This study will help to resolve environmental issues for MMS program managers and to increase public confidence in the data used by the OCS program.

Date Information Required: Workshops are needed for post-lease NEPA documentation for Beaufort Sea Lease Sales in 2003, 2005, and 2007, Chukchi/Hope Basin Lease Sale in 2007, and DPP's. The need for the transfer of studies information is ongoing. The dates will be coordinated with lease sales.

Revised date: September 2003

SECTION 2.2 Profiles of Studies Proposed for FY 2004

Table 1 Profiles of Studies Proposed for FY 2004

September 2003

Page #	Title
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147	Surface Circulation Radar Mapping in Alaskan Coastal Waters: Field Study Beaufort Sea and Cook Inlet
	<u>Fate and Effects</u>
149	Improvements in the Fault Tree Approach to Oil Spill Occurrence Estimators for the Beaufort and Chukchi Seas
151	Empirical Weathering Properties of Oil in Snow and Ice
	<u>Biology</u>
153	Workshop and Field Evaluation of Bird Hazing/Deterrent Techniques
	<u>Protected Species</u>
155	Monitoring Key Marine Mammals: Lower Cook Inlet
157	Passive Acoustic Monitoring of Whales in Lower Cook Inlet
159	Survey of Steller's Eiders Wintering in Lower Cook Inlet
161	Movements and Habitat Use of Harbor Seals in Cook Inlet
163	Review and Monitoring Ambient Artificial Light Intensity in the OCS and the Potential for Effects on Resident Fauna
165	Aerial Photography of Bowhead Whales to Estimate the Size of the Bering-Chukchi-Beaufort Population
	<u>Social and Economic</u>
167	Researching Technical Dialogue with Alaskan Coastal Communities: Analysis of the Social, Cultural, Linguistic, and Institutional Parameters of Public/Agency Communication Patterns

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2004

Region: Alaska

Planning Areas: Beaufort Sea, Cook Inlet

Type: Competitive or Joint Funding

Title: Surface Circulation Radar Mapping in Alaskan Coastal Waters: Field Study Beaufort Sea and Cook Inlet

Period of Performance: FY 2004-2006

Description:

Background Over the past 25 years, oceanographic radar techniques have been developed and improved so that detailed, gridded, 2-dimensional maps of surface circulation can be provided and recorded in real time. Currents would play a critical role in the transport and fate of spilled oil, but there is paucity of direct circulation measurements in some areas of the Beaufort Sea and Cook Inlet. Current meters provide only data at specific points and not at the water surface, where the oil would be. These radar techniques provide a measured equivalent of a gridded circulation model and can be used as input to and validation for oil spill trajectory models.

Several entities, including MMS, NOAA, the Prince William Sound Oil Spill Recovery Institute, the University of Alaska Fairbanks, and oil industry have expressed interest in using circulation mapping radar techniques in Alaskan coastal waters. The radar units are expensive and cost and use-sharing rental agreements among multiple users is a preferred approach. This study presumes the development of a users group to cost and use sharing of radar units under a prior Feasibility Study.

Objectives This study's objectives would be to implement the Beaufort Sea and Cook Inlet radar mapping strategies. This study would require an additional funding commitment from MMS and may be dependent on cost sharing among the radar users group.

Methods

1. Implement a radar mapping strategy for Beaufort Sea.
2. Implement a radar mapping strategy for Cook Inlet.

Importance to MMS The Oil-Spill-Risk Analysis (OSRA) is a cornerstone to regional EIS's environmental assessments, and oil-spill-contingency planning. MMS is being tasked with providing circulation and oil-spill-trajectory information at higher resolution than feasible or justifiable by current modeling state-of-the-art or current-meter technology. Oil-spill issues constitute a significant portion of public comments submitted on sale or development EIS's in the Alaska OCS Region.

Date Information Required: Information from this study will be used for post-lease NEPA documentation for Beaufort Sea Lease Sales in 2003, 2005, and 2008, Cook Inlet Lease Sales 191 and 199, including review of oil-spill-contingency plans.

Revised date: September 2003

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2004

Region: Alaska

Planning Areas: Beaufort and Chukchi Seas

Type: Contract Modification or Competitive

Title: Improvements in the Fault Tree Approach to Oil Spill Occurrence Estimators for the Beaufort and Chukchi Seas

Period of Performance: FY 2004

Description:

Background The MMS has been estimating the likelihood of Arctic oil spills in Alaska OCS Region EIS's for a quarter century, mostly based on what has happened elsewhere on the OCS. Now that Arctic OCS oil production is occurring, the methodology and validity of the MMS spill estimates used for Arctic OCS areas are increasingly questioned by other government agencies, the public, and oil industry. The standard U.S. Outer Continental Shelf (OCS) historical platform and pipeline crude oil spill estimates are based on the Gulf of Mexico and Pacific OCS experience. This spill record does not include pipeline spills inshore of the OCS, in State waters, or on land. The MMS Alaska OCS Region is examining spill occurrence based on Regional considerations, such as Alaska North Slope and Arctic Canada rather than on the Gulf of Mexico and Pacific OCS experience. We also need to include all major pipeline spills, both onshore and offshore, in environmental risk assessment. The first step in this process was a prior study (OCS Study MMS 2000-007) that collated available information on crude and diesel spills of at least 100 bbl from the oil industry in the Alaska North Slope and Arctic Canada; and that estimated provisional occurrence rates for use in the nearshore Beaufort Sea OCS. A second step in this process was developing fault tree estimates (OCS Study MMS 2002-047) of spill occurrence taking into account (1) differences in risk factors between the Arctic and Gulf of Mexico OCS and (2) Arctic-specific factors.

Objectives The objective is to improve the initial fault tree model approach by:

1. Generating additional model validation and statistical measures from oil spill statistical data.
2. Providing MMS with fault tree scenarios for environmental assessment of future exploration and development.
3. Providing MMS with user-friendly software to develop scenario-specific fault tree oil spill occurrence estimates for future environmental assessment.

Methods

1. Use the fault tree model of oil spill occurrence to generate additional model validation information from specific non-Arctic scenarios, such as Cook Inlet and Gulf of Mexico

projects, which have an oil spill statistical history.

2. Use the model in a sensitivity analysis to identify the importance of different Arctic variables to provide a prioritized list of variables having the highest potential impact on Arctic oil spills.
3. Use Gulf of Mexico OCS historical data together with its measures of spill size variance and setup the Monte Carlo fault tree model to run with these measures of variance.
4. Generalize the model so that it can be run both in an expected value and distributive value (Monte Carlo) form.
5. Expand the fault tree analytical system to include causeway pipelines.
6. Develop fault tree scenarios with risk factors, for Liberty and McCovey environmental assessments.
7. Convert the current fault tree model into a user-friendly software package, which can be used to estimate oil spill occurrence and characteristics for future scenarios. Include modular structure, user manual, online help, password protected parameters and algorithms, and extensive graphical outputs.
8. Provide professional support to MMS in regard to statistical issues of occurrence rates and estimator(s) related to this study and its results.

Importance to MMS The Oil-Spill-Risk Analysis (OSRA) is a cornerstone to regional EIS's, environmental assessments, and oil-spill-contingency planning. Oil-spill issues constitute a significant portion of public comments submitted on sale or development EIS's in the Alaska OCS Region. This study responds to technical recommendations provided to MMS on the fault tree oil spill risk approach used in Beaufort Sea Multi-Sale EIS.

Date Information Required: Information from this study will be used in post-lease NEPA documentation for Beaufort Sea Lease Sales in 2003, 2005, and 2007, Chukchi Sea Lease Sale 2007, potential Liberty and McCovey development environmental assessments, and review of oil-spill-contingency plans for OCS and coastal facilities.

Revised date: September 2003

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2004

Region: Alaska

Planning Areas: Beaufort Sea, Chukchi Sea, Hope Basin, Cook Inlet

Type: Competitive or Joint Funding

Title: Empirical Weathering Properties of Oil in Snow and Ice

Period of Performance: FY 2004-2006

Description:

Background Oil spill weathering models are used in National Environmental Policy Act (NEPA) analysis as well as Oil Discharge Prevention and Contingency Plans (ODPCPs). The results of these models are used to estimate impacts in NEPA analysis as well as pre-planning for oil spill response. A modest amount of work in the field was done in the 1970's and 1980's on first order physics for oil weathering in ice. Additional studies have continued in the laboratory in the late 1980's and 1990's, but were generally limited to low viscosity, low pour-point oils. We now know that oil weathering is strongly dependent on the specific chemical composition and characteristics of individual crudes. The physical and chemical data required by modern state-of-the-art models (such as the SINTEF oil weathering model used by MMS in Alaska) are scarce, of poor quality, or nonexistent for oil-ice interaction. Such models, therefore, ignore the more difficult aspects of oil-in-ice weathering. Sophisticated measurement techniques currently available would enable precise measurements regarding oil evaporation, spreading, and dispersion in ice (as well as on ice) as a function of oil type and chemistry.

Objectives

1. For low and high pour-point oils, measure emulsification, evaporation, dispersion, spreading, slick thickness, and oil composition in an ice field and snow on top of sea ice.
2. Develop a database on oil weathering in ice fields for use in model validation.
3. Use these data, in concert with other oil-ice weathering data, to validate and enhance or develop new algorithms of oil weathering in ice.

Methods Collect and analyze data on weathering of oil in ice and snow on top of sea ice, including but not limited to evaporation, emulsion, dispersion, spreading and slick thickness. Dependant tasks include developing a dataset from the experimental data for use to validate weathering algorithms and oil weathering models in the presence of ice. Create a database or experimental data set of oil weathering parameters in ice fields and snow. Some of this work should be done with both high and low pour point oils. Liberty crude would be an example of a high-pour crude with pour point above environmental temperatures. Validate or enhance oil in

ice weathering algorithms. Include recommendations for new algorithms in the oil weathering model that are validated by the field results.

Importance to MMS The Alaska Region of the MMS leases in areas which are ice covered. Better estimates of the weathering of oil in snow and ice are important to further impact assessment and oil spill contingency and response planning.

Date Information Required: For post-lease NEPA documentation for Beaufort Sea Lease Sales in 2003, 2005, and 2007, Cook Inlet Lease Sales in 2004 and 2006, Chukchi Sea/Hope Basin Sale in 2007, DPP's, and their associated Oil Discharge Prevention and Contingency Plans.

Revised date: September 2003

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2004

Region: Alaska
Planning Areas: Beaufort Sea
Type: Competitive
Title: Workshop and Field Evaluation of Bird Hazing/Deterrent Techniques

Period of Performance: FY 2004

Description:

Background Despite cleaning and rehabilitation efforts associated with oil spills, most oiled birds do not survive. Prevention of contact with spilled oil would avoid this mortality and the expense of operating an avian treatment facility that invariably is associated with a major oil spill. The Wildlife Protection Guidelines for Alaska within the State/Federal Unified Response Plan identifies hazing wildlife away from and deterring entry into a spill area as secondary response strategies for minimizing oil effects. Birds tend to avoid areas where disturbing human activities or devices producing loud sounds occur. These include aircraft and motorboat operations, and devices such as Breco buoy, wailer, 12-gauge cracker shell, and propane cannon. The latter devices, intended to haze birds away from a specific area, have been used in the field or undergone some evaluation for effectiveness. However, none of these have been rigorously tested under specific biological, oceanographic, or climatic conditions that would prevail if an oil spill occurred in the Beaufort Sea. Nor have studies focused on determining the effectiveness of a combination of hazing techniques in habitats similar to those in the Beaufort Sea. Field testing of hazing/deterrent devices and techniques to evaluate their effectiveness under Beaufort Sea conditions would aid in the development of oil spill response contingency planning in these areas. Because this involves a relatively unexplored area of investigation, field testing will be preceded by a workshop to evaluate available hazing/deterrent techniques and design a field research protocol to accomplish the field testing effectively.

Objectives To develop methods to haze and deter birds away from potential oil spills.

Methods

Workshop Phase:

1. Convene a facilitated workshop of knowledgeable industry and governmental experts in the field of bird hazing and deterrence and/or allied fields.
2. Conduct a review of published and unpublished literature on this topic, for focal species (i.e., long-tailed duck, common eider, king eider, spectacled eider, loons, phalaropes).
3. Have these experts evaluate the apparent effectiveness of a suite of bird hazing/deterrent devices and techniques that may be used to haze birds from or deter their entry into the vicinity of an oil spill in the Beaufort Sea.

4. Have this panel design a detailed field testing protocol, based on this evaluation, for hazing and deterrence devices and methods that show the most promise for use in the Beaufort Sea environment under a variety of circumstances.
5. Select test and control sites based on aerial survey and other information on focal species distribution and behavior including oil spill scenarios projected by the MMS Oil Spill Risk Analysis model.
6. Summarize recommendations in workshop report.

Field Phase: As appropriate, following the workshop, the following may be initiated:

1. Record bird species, flock sizes, and activity in test and control sites prior to initiating hazing/deterrence activities.
2. Expose bird flocks of varying flock size, species, activity, sex, and status (e.g., molting, nonmolting) from major habitats used by these species under various oceanographic/climatic conditions (e.g., open-water, broken-ice, fog), timeframes (hours, days), and at various times during the period of presence (May-October) to selected devices, including Breco buoy, and techniques individually, and in combination and sequence; record numbers of individuals remaining by species, distance from hazing device(s), effort of hazing activities, and other appropriate measures of effectiveness.
3. Repeat the exposure experiments substituting a simulated oil spill scenario and utilizing multiple devices and/or techniques over an area comparable to that projected to occur after 10 days as a result of spilling the most likely volume of oil assumed by MMS in OCS EIS/EA MMS 2002-029.
4. Quantify differences in effectiveness of bird hazing from a simulated oil spill area in the Beaufort Sea using the most likely volume and discontinuous area projected by the Oil Spill Risk Analysis model.
5. Make recommendations for any modifications of recommended bird hazing kits and procedures in the Alaska Clean Seas (ACS) Technical Manual and Oil Discharge Prevention and Contingency Plan.

Importance to MMS The workshop will provide information to formulate procedures and protocols for a full study to test these technologies. These technologies could be used in oil spill response contingency planning to mitigate potential impacts to birds resulting from OCS activities in the Beaufort Sea.

Date Information Required: This information would be useful for post-lease permit approvals after Beaufort Sea Lease Sales in 2003, 2005, and 2007, and DPP's.

Revised date: September 2003

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2004

Region: Alaska
Planning Areas: Cook Inlet
Type: Competitive or Joint Funding
Title: Monitoring Key Marine Mammals: Lower Cook Inlet

Period of Performance: FY 2004-2008

Description:

Background A number of species of marine mammals regularly utilize near-shore habitat in lower Cook Inlet, including: Steller's sea lions, harbor seals, sea otters, harbor porpoise, Dahl's porpoise, and minke whales. In addition to the endangered Steller's sea lion, harbor seals and sea otters may have regionally declining populations and are potential candidates for listing under the Endangered Species Act in at least some of their range in southern Alaska.

Significant concentrations of harbor seals and sea otters have been identified in Kamishak Bay in southwestern Cook Inlet. Kamishak Bay is also likely to be vulnerable to pollution in the event of an oil spill, as was evidenced when oil spilled by the *Exxon Valdez* was deposited as tar balls and mousse on the beaches of western Cook Inlet, including Kamishak Bay. Thus, local concentrations of some marine mammals in Kamishak Bay may be vulnerable if oil is developed in nearby OCS waters of Cook Inlet.

Kamishak Bay is relatively isolated and has been little studied with respect to the population status of local marine mammals. This study is designed to provide pre-development baseline data on the status of key marine mammals using the waters in, and near, Kamishak Bay.

Objectives Obtain pre-development baseline data on the status of key marine mammals using the waters in, and near, Kamishak Bay,

Methods Develop and execute protocols for:

1. Aerial and/or boat surveys of abundance of key marine mammals in Kamishak Bay.
2. Surveys of productivity of key marine mammal populations in Kamishak Bay.
3. Monitoring the body condition and/or measuring body growth of key marine mammals in Kamishak Bay for about 5 years to provide suitable data and confidence intervals for comparison with post-development studies

Importance to MMS Data on abundance and population status of key species will be used for comparisons with similar data collected following oil and gas development. Analysis will

increase understanding of the effects of such development on populations of key marine mammals. New data will also be available for use in EIS development.

Date Information Required: For post-lease NEPA documentation for Cook Inlet Lease Sales in 2004 and 2006, and DPP's.

Revised date: September 2003

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2004

Region: Alaska

Planning Area: Cook Inlet

Type: Joint Funding or Competitive

Title: Passive Acoustic Monitoring of Whales in Lower Cook Inlet

Period of Performance: FY 2004-2006

Description:

Background Numerous species of cetaceans can occur within or near the proposed Cook Inlet Lease Sale area. However, for all of these species, we have considerable uncertainty about their patterns of use of these areas.

At least two species of endangered baleen whales (humpback and fin whales) have been sighted in areas within or very near the proposed Cook Inlet Lease Sale. Fin whales are present in Shelikof Strait year-round, but their use of the entrances to Cook Inlet and of southern Cook Inlet is not well-studied. Humpback whales are known to feed seasonally in the area near the Barren Islands, and to occur seasonally in southern Cook Inlet and Shelikof Strait. However, neither abundance in, nor seasonal use patterns of, these areas are well documented. The intensity of their use of northern Shelikof Strait, the entrances to Cook Inlet, and southern Cook Inlet are not well-defined. Sei whales have been, but are rarely, sighted in Shelikof Strait. Individuals from the eastern stock of the North Pacific right whales, the most highly endangered large cetacean population in the world, have been sighted in the Gulf of Alaska, outside of the Kenai Peninsula and off of Kodiak Island. It is believed that this species does not occur in Cook Inlet or Shelikof Strait. However, its potential use of the areas near the Barren Islands is unclear. On the outer coast of Kodiak Island, this species has been sighted in areas in which humpback whales also feed.

The Cook Inlet stock of beluga whales, listed as depleted under the MMPA and as a candidate species under the ESA, occurs within the inlet. At present, its non-summer and especially its winter, distribution and habitat use is not well understood. Relatedly, the use of the lower inlet, the entrances to Cook Inlet, and the Gulf of Alaska by beluga whales is also not well understood. Some individuals or groups from this population may travel outside of the inlet in all or some winters.

Some species of cetaceans may be adversely affected by activities associated with OCS oil and gas. For example, underwater noise associated with industry activities may cause some species or some segments of some species of whales to avoid areas where exploration is occurring. Additionally, other types of activity associated with oil and gas development may disturb, and modify the behavior of, whales. While the sensitivity of cetaceans to large and very large oil spills is not well-studied, oil spills could potentially have adverse effects on, or even result in the

death of, cetaceans that surfaced in fresh oil and that inhaled high concentrations of volatile components of crude oil.

In the proposed study, passive acoustic monitoring would be used to estimate the seasonal patterns of use of the proposed Cook Inlet Multi-sale area by both toothed and baleen threatened and endangered cetaceans.

Objectives

1. Baleen Whales--Estimate the intensity and patterns of use of the proposed Cook Inlet Multi-Sale area by at least 4 threatened or endangered baleen whale species.
2. Beluga Whale--Estimate the intensity and patterns of use of the proposed Cook Inlet Multi-Sale area by beluga whales.
3. Five species in the proposed Cook Inlet Multi-Sale area--estimate relative abundances.
4. Evaluate areas within the proposed Cook Inlet Multi-Sale area that are hypothesized to be important to these species.

Methods

1. Deploy an array of continuous seafloor acoustic recorders in the deeper waters of Lower Cook Inlet and Shelikof Strait to address the objectives for baleen whales.
2. Deploy hydrophone arrays with shore based continuous recorders in Kachemak Bay and selected bays along the coastline of western Cook Inlet to address the objectives for beluga whales.
3. Analyze, map and otherwise display data to optimize utility for risk assessment.

Importance to MMS Study results will be generally useful to support NEPA and ESA pre- and post- lease analyses. Under both the MMPA and the ESA MMS evaluates which species could be affected by activities that it permits and estimates when such effects could and could not occur. Such information underlies Incidental Take Authorizations and specific mitigation requirements associated with activities that may result in the taking of a cetacean.

Date Information Required: Study results will be useful for post-lease NEPA documentation for Cook Inlet Lease Sales in 2004 and 2006, and DPP's.

Revised date: September 2003

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2004

Region: Alaska
Planning Area: Lower Cook Inlet
Type: Intra-agency Agreement
Title: Survey of Steller's Eiders Wintering in Lower Cook Inlet

Period of Performance: FY 2004-2005

Description:

Background In 1997, the Alaska-breeding population of the Steller's eider was listed as threatened under the Endangered Species Act. The decision to list was based on the observed substantial decrease in the nesting range of Steller's eiders breeding in Alaska, the overall reduction in numbers of Steller's eiders nesting in Alaska, and the increased vulnerability of the remaining breeding population to extinction (Draft Recovery Plan, USFWS 2001).

Steller's eiders that breed in northern Alaska and Russia winter in the lower Cook Inlet, but the distribution and abundance of the species is currently uncertain. Moreover, the relative proportion of birds wintering in Cook Inlet from the Russian population versus the threatened Alaska population is not known. Opportunistic observations indicate that Steller's eiders, numbering in the hundreds to thousands, winter in lower Cook Inlet (Unpublished USFWS Reports, Larned 1997, 2001). Steller's eiders have frequently been observed along the Homer Spit, arriving in early- to mid-November and departing by the end of April. Concentrations of wintering Steller's eiders have been reported from both the eastern and western coastlines of Lower Cook Inlet, but the majority of the sightings have been reported from the shoal extending from the Homer Spit, westward in Kachemak Bay, around Anchor Point and northward to Clam Gulch

A cooperative study between the USFWS and MMS in 1993-1994 suggested that aerial surveys were much more effective than offshore boat surveys for detecting flocks of Steller's eiders (OCS Study: MMS 94-0063, Agler et al. 1994). Systematic aerial surveys to identify the timing and location of Steller's eiders that winter in lower Cook Inlet would be useful for ongoing analyses of the environmental consequences of potential oil and gas development proposed for that area by MMS.

Objectives

1. Identify locations important to Steller's eiders wintering in lower Cook Inlet.
2. Understand temporal variation in Steller's eiders winter use of the waters in lower Cook Inlet.

3. Estimate numbers of Steller's eiders wintering in lower Cook Inlet.

Methods Surveys will be flown in lower Cook Inlet by experienced observers along transects perpendicular to the coastline in fixed-winged aircraft. Coverage will be from the shoreline to the 20 m isobath. Surveys will be flown monthly from December through early-April for a total of 5 surveys per year for 2 years.

Importance to MMS MMS plans Cook Inlet Lease Sales for 2004 and 2006. Related potential risk to Steller's eider populations can best be understood if temporal and spatial variation in the distribution of Steller's eiders wintering in lower Cook Inlet is fully documented.

Date Information Required: For post-lease NEPA documentation for Cook Inlet Lease Sales in 2004 and 2006, DPP's, and risk analysis.

Revised date: September 2003

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2004

Region: Alaska
Planning Areas: Cook Inlet
Type: Interagency
Title: Movements and Habitat Use of Harbor Seals in Cook Inlet

Period of Performance: FY 2004-2007

Description:

Background In recent decades, the abundance of harbor seals has declined at several Alaskan locations. For example, counts of harbor seals at Tugidak Island declined 85% between 1976 and 1988 (Pitcher 1990); in Bristol Bay and the north side of the Alaska Peninsula, recent seal counts are less than 42% of 1975 numbers (Withrow and Loughlin 1995); and trend site counts in Prince William Sound suggest declines in harbor seal populations of approximately 63% between 1984 and 1997 (Frost et al. 1999). The significance and causes of these declines are unknown, but concern is rising about the present and future status of Alaska harbor seal populations, most notably in the Gulf of Alaska. Because of the proximity of the declining populations to Cook Inlet, and the inherent vulnerability of harbor seals to spilled oil, it is particularly important to assess the potential impacts of oil and gas activities on the harbor seal population in the Cook Inlet Region.

The commonly used approach to estimate harbor seal distribution and abundance employs aircraft-borne observers that count seals when they haul out of the water and are visible. In Alaska, aerial surveys have generally been conducted during the molt period (August-September) when the number of seals hauled out is thought to be highest and the weather conditions are likely to be most favorable for flying. Haul-out patterns at other times of the year are not well known. Since any seal's activity budget includes a significant time away from haul outs, information is also needed about at-sea behaviors for oil spill risk assessment. The proposed study would employ satellite telemetry to study the movements, foraging behavior, and habitat use of individual harbor seals in Cook Inlet. This study would also result in a coordinated benefit to ongoing MMS-funded aerial surveys of harbor seals by allowing a correction of survey counts for the numbers of animals missed when they are not hauled out.

Objectives The general goal of this study is to employ satellite telemetry to document the movements, foraging behavior, and habitat use of harbor seals in Cook Inlet. Specific objectives are to:

1. Enhance estimates of harbor seal abundance in Cook Inlet by determining and applying a correction factor to survey counts of harbor seals from concurrent aerial surveys at haul outs in Cook Inlet.
2. Obtain Cook Inlet-wide information on harbor seal relative abundance, distribution and

- behavior with emphasis on habitat other than major haul outs.
3. Identify and prioritize any specific habitat areas that are or particular importance to the Cook Inlet harbor seal population(s) for specific activities such as feeding, breeding, pup rearing, wintering, etc.
 4. Conduct a comprehensive evaluation of whether individual populations (or stocks) exist in the MMS Cook Inlet planning area.

Methods

1. Capture and instrument 30 seals in each of 3 successive years (N = 90) with Argos satellite-linked time-depth recorders (TDR's). Seals to be instrumented would include approximately equal proportions of juveniles, adult females and adult males each year. Seals would be captured from locations throughout Cook Inlet, in relative numbers that are proportionate to local abundance.
2. Develop necessary statistical analyses or statistical models to produce a correction factor for harbor seal abundance derived from aerial surveys at haul outs.
3. Use movement and behavioral data from this study with any existing published results or other data in a comprehensive analysis of harbor seal distribution and habitat use in, or adjacent to, the MMS Cook Inlet Planning Area.
4. Use text, maps, photographs or other data summaries to portray harbor seal distribution and habitat use in Cook Inlet for use in oil spill risk analysis.
5. Produce a synthesis of movement data, and other existing evidence (e.g. genetic analyses or tagging studies) to evaluate whether individual populations (or stocks) exist in the MMS Cook Inlet planning area. Use tissue samples obtained from instrumented seals for supplemental genetic analyses, if needed.

Importance to MMS This study will provide valuable information about a harbor seal population (or populations) that is used for subsistence by local Alaska Natives and that is exhibiting a trend toward seriously declining abundance. The study will provide information that addresses public concerns raised during MMS outreach. Information on distribution, abundance and behavior will be used in pre- and post-lease assessments and could form the basis for post-development monitoring if oil or gas related development is undertaken in the MMS Cook Inlet Planning Area. This proposed study augments the ongoing MMS study entitled, "Distribution and Abundance of Harbor Seals" by providing a correction factor and other information on the distribution and behavior of seals away from established haul-outs.

Date Information Required: Quarterly and Annual Reports will provide information for NEPA documentation for the proposed Cook Inlet Lease Sale in 2006. Information will be useful for post-lease assessments and monitoring after the Lease Sale in 2004.

Revised date: September 2003

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2004

Region: Alaska

Planning Areas: Beaufort Sea, Chukchi Sea, Hope Basin, Cook Inlet

Type: Competitive

Title: Review and Monitoring Ambient Artificial Light Intensity in the OCS and the Potential for Effects on Resident Fauna.

Period of Performance: FY 2004-2007

Description:

Background Stipulation No. 8 of the MMS Final Beaufort Sea Multisale EIS (February 2003) requires that all structures associated with offshore drilling must be lighted in order to avoid avian mortality. But light radiating outward from structures must be minimized. Other industrial support facilities such as the buildings and storage areas at West Dock, structures at Endicott Spur Drilling Island, structures and work areas on Northstar Island and support vessels and supporting facilities are already brightly lighted. More lighted structures can be expected as OCS development proceeds.

Little study has been made of the introduction of artificial light into the formerly dark habitat of numerous species of marine invertebrates, fish, water birds, and mammals. These include a number of protected marine mammals that live in, or migrate through, potentially artificially lighted habitat. At a recent interagency coordination meeting the issue of potential conflict between lighting strategies and other non-avian marine life was raised. The proposed study will address the issue of artificial light in the dark arctic by conducting a literature review and possibly thereafter a light monitoring program. The study will lay groundwork for studies of ecological effects of increasing artificial lighting at several trophic levels.

Objectives

1. Review the literature and evaluate the theoretical basis of artificial lighting effects on the physiology, reproductive biology and/or behavior of key predators and their forage species in the Beaufort Sea area.
2. Plan and/or initiate long-term, meso-scale monitoring to measure and document general levels of ambient light in the Beaufort Sea OCS: (a) Design appropriate sampling methods and regime and (b) measure and document light in specific OCS development areas at various distances from sources, including new sources as they are created.
3. Initiate relevant ecological studies of Arctic marine systems in the vicinity of artificial light sources to estimate any effects of artificial light on the system's trophic processes, and productivity, and behaviors.

Methods

All activities will be coordinated with ongoing industry studies as appropriate.

Phase I:

1. Conduct a comprehensive literature review. Prepare an annotated bibliography and summary report on the potential effects of artificial ambient lighting on relevant taxa.
2. Hold a facilitated scientific meeting to make recommendations on the justification for, and design of, a monitoring program. Recommendations for specific studies, defined under Objective 3, will also be recorded.

Phase II:

1. If justified, initiate a meso-scale monitoring study to document the intensity of artificial ambient lighting as per Objective 2, above.
2. Refine design and initiate focused ecological studies, as per Objective 3.

Importance to MMS Information from this study will potentially be useful for evaluating the effects of post-lease development on various protected or endangered species, including: spectacled eider, Steller's eider, Bowhead whale, Beluga whale, polar bears, ringed-seals, and several other cetaceans and pinnipeds. If ambient light is found to have effects on these, or other, local fauna, mitigation measures can be designed and initiated through stipulations in future development- or production-oriented EIS's or permits. Information from this study may be used to update any extant MMS/FWS cooperative lighting protocols recommended for offshore oil and gas development.

Date Information Required: This planning and monitoring study can be most effective if initiated before significant additional development involving the deployment of artificial light sources is undertaken. Results will be useful for mitigation related to developments that may be proposed during the next few years, for example: Liberty and McCovey.

Revised date: September 2003

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2004

Region: Alaska
Planning Area: Beaufort Sea
Type: Joint Funding
Title: Aerial Photography of Bowhead Whales to Estimate the Size of the Bering-Chukchi-Beaufort Population

Period of Performance: FY 2004-2005

Description:

Background An aerial photographic survey of bowhead whales was conducted during the spring of 2003 based out of Barrow, Alaska. This survey was very successful with >750 photographs having been obtained. If a second survey is conducted during the spring of 2004, it will be possible to make an estimate of the current population size using mark-recapture techniques. The survey needs to be conducted in 2004 to minimize changes in the population between the two surveys. If a survey is not conducted in 2004, it will be necessary to fund two consecutive years of photography (rather than just one in 2004) to be able to make the population estimate. The project is envisioned as a jointly funded effort, including but not limited to NMFS, NSB, and MMS. Additional funding sources may be involved as needed to seek additional population dynamics information.

Objectives The primary goal of the survey is to estimate the size of the bowhead whale population using photogrammetric mark-recapture methods and data collected during 2003 and 2004. Specific objectives for accomplishing this goal include:

1. Conduct an aerial photographic survey of bowhead whales in the spring of 2004.
2. Analyze the 2004 photographs to identify the recurrence of individual whales previously photographed in 2003.
3. Use mark-recapture methods and calculations to estimate the population of bowhead whales.

Methods This jointly-funded study would be conducted using methods already developed in 2003 by NMFS and NSB. Required permits for low-level photography would be obtained as needed well in advance of the 2004 field season. The draft final report to MMS would include full description of the aerial survey protocol, mark-recapture methods used, analysis of collected data, and discussion of findings relative to population estimation. Other ancillary population dynamics parameters obtained on growth rates, survival rates, migration timing, calving intervals and population structure (length-frequency distribution) may be included.

Importance to MMS Biological information about the status of endangered bowhead whale stocks is useful for OCS management and to maintenance of the centuries-old subsistence lifestyle along the north coast of Alaska. Two of the most important statistics are current population size and population trends. Population estimates are typically generated via ice-based censuses at Barrow; however, few (if any) data exist to confirm the apparent population increases indicated by these counts. Credible confirmation of population size would help evaluate whether the Bering-Chukchi-Beaufort bowhead whale population should be down-listed to the threatened species list. Other life history parameters (migration timing, etc) obtained from the study would likewise be useful for management of offshore activities.

Date Information Required: Information from the study is needed for post-lease NEPA documentation for Beaufort Sea Lease Sales in 2003, 2005, and 2007, and DPP's.

Revised date: September 2003

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2004

Region: Alaska

Planning Areas: Beaufort Sea and Lower Cook Inlet

Type: Competitive

Title: Researching Technical Dialogue with Alaskan Coastal Communities: Analysis of the Social, Cultural, Linguistic, and Institutional Parameters of Public/Agency Communication Patterns

Period of Performance: FY 2004-2006

Background: Technical dialogue plays an important role in shaping OCS decisions, yet relatively little research has been devoted to investigate the communication processes between technical professionals and citizen stakeholders. Some research of this nature has been done, but not in Alaska, where distinctive resource management issues and distinctive social, cultural, linguistic, and institutional differences exist. Previous social research indicates that differing knowledge bases and paradigms routinely complicate the communication efforts of federal institutions in Alaskan coastal communities. Some agencies, such as the USDA Forest Service, have already made significant progress in efforts to assess and improve the effectiveness of their written communication methods with the public.

The proposed research would specifically investigate the effects of MMS written communication efforts in selected coastal communities and try to improve communication processes with local stakeholder groups. It would systematically identify and analyze potential communication obstacles and then pursue remedies through pilot-testing a series of experimental “newsletters” on targeted focus groups. Is MMS successfully communicating the messages that it intends to communicate? Does a particular communication have any measurable effect on relevant local understandings? Are unintended messages being communicated? Can MMS improve communication techniques through cost efficient measures? Can issues of public trust be addressed through a more effective written communication process?

If specific written communication problems can be identified through controlled testing, the study would then seek to provide both a rationale and a method to explore potential changes in future agency communication strategies with regard to:

- message content
- mechanisms of message delivery
- timeliness of communication
- availability and use of supporting materials and information

Objectives

1. Assess the measurable effectiveness of MMS written communication methods with various communities of coastal Alaska.

2. Identify potential obstacles in MMS written communication efforts and develop a strategy for their amelioration.
3. Generate specific recommendations for improved written communication methods and for their implementation in agency processes.
4. Improve prospects for public/agency communication and collaboration in resource management issues of the Alaskan OCS.

Methods

1. Analyze and catalogue the record of public comments from Cook Inlet and the Beaufort Sea to assess the scope and character of manifest communication issues and regional opinions about offshore oil development and MMS regulatory processes.
2. Conduct a literature search to assess alternative federal agency written communication efforts with local populations that are relevant to MMS goals and processes.
3. Identify appropriate samples of study participants in communities on the North Slope and the Kenai Peninsula.
4. Devise a cost effective procedure to create focus groups to assess public knowledge and attitudes about the OCS regulatory environment, the communication of scientific and technical information, and key agency messages.
5. Work with MMS management and staff to prepare new (theory-driven) textual materials to disseminate agency statements under controlled and variable circumstances, including the preparation and distribution of various “newsletters” to compare their effectiveness as measured across a range of key variables.
6. Monitor changes in understanding, perceptions of OCS management, and durability of opinions among study participants because of pilot-test materials.
7. Continue to test and monitor communication efforts in a limited and controlled newsletter format until a model based upon “lessons learned” can be implemented.
8. Coordinate communication processes with other relevant MMS studies.

Importance to MMS: Since MMS is charged with the fundamental responsibility of communicating to a diverse public through the preparation of regulatory measures, Environmental Impact Statements, and other documents, an analytic investigation of alternative communication processes and their effects on key constituents is highly relevant. This study would evaluate the effectiveness of various communication strategies, explore prospects for altering future communication efforts, and seek to make the regulatory process more effective in the Alaska region. By seeking to reduce areas of miscommunication and stressful impact on resident stakeholders, this study will enhance the ability of the public to participate more fully in the NEPA process.

Date Information Required: FY 2005

Revised date: September 2003

Section 2.3 Profiles of Studies Proposed for FY 2005

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ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2004

Region: Alaska
Planning Area: Beaufort Sea
Type: Joint Funding or Competitive
Title: Mapping Sea Ice Overflow Using Remote Sensing from Smith Bay to Camden Bay

Period of Performance: FY 2005-2006

Description:

Background MMS has limited spatial and temporal information on rivers overflowing the nearshore sea ice in spring. The most recent work, Dickins (1999), focused on overflow of the Sagavanirktok River in the vicinity of the proposed Liberty prospect. There are also three years of overflow data for the Kuparuk River in the vicinity of Northstar. Landsat Imagery has been collected by Stringer (1988, 1993) and archived at the University of Alaska Geophysical Institute for the Beaufort Sea. With the advent of development in the Beaufort Sea this type of information is needed to address issues regarding pipeline routing and facility siting. This study would provide baseline data and improve the accuracy of information for environmental assessment and hazard mitigation. These observations would also be of value to the offshore industry for planning operations on the OCS.

Objectives The objectives of this project are to produce a time series depicting the spatial distribution of river water overflowing the landfast ice adjacent to the Beaufort sea coast where exploration and development may occur. A second objective is to quantify the relationship between stream flow and ice damming for the Sagavanirktok and Kuparuk rivers, and the aerial extent of overflowing on the landfast ice adjacent to those rivers

Methods

1. Collect and synthesize existing Landsat/Radarsat remote sensing data.
2. Quantify the spatial and temporal distribution of river overflow of the moderate size rivers on the North Slope of Alaska from Smith Bay to Camden Bay. Focus on mapping the maximum overflow extent.
3. Fly an aerial survey for one season to ground truth remote sensing data and quantify uncertainties of estimating the overflow from remotely sensed data.
4. Collect new hydrographic data for the Sagavanirktok and Kuparuk rivers and quantify any relationship between river runoff and aerial extent of overflow.

5. Create a geographic information system map summarizing the spatial distribution of river overflow by year along the Beaufort Sea Coast. Provide individual years as well as maximum historical overflow extent.
6. Provide relevant attributes to spatial data for use in a geographic information system.

Importance to MMS Analysis of overflow and its implications for exploration and development requires information on both the temporal and spatial distribution of ice overflow from the breakup of North Slope rivers in the spring. This information is useful to evaluate how overflow limits affect pipeline and ice road routes and siting of gravel islands and exploration platforms. This information is also important to the development of hydrological models to feed the ocean general circulation model for local forcing in the nearshore region of the Beaufort Sea. In addition, this information could be used to assist in the development of ice models and their performance during breakup in the landfast ice zone.

Date Information Required: Data collection will be ongoing and the information will be fed into our data processing and analysis procedures. The data will be used for post-lease NEPA for Beaufort Sea Lease Sales in 2003, 2005, and 2007, and DPP's.

Revised date: September 2003

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2004

Region: Alaska
Planning Area: Beaufort Sea
Type: Competitive or Interagency
Title: Hydrological Modeling along the Alaskan Arctic Coast

Period of Performance: FY 2005-2007

Description:

Background There is a strong need to focus on hydrological observations and processes to evaluate river runoff processes along the Arctic coast. These include terrain elevation, terrain ground cover, precipitation, snow drifting, and melting. For the North Slope of Alaska, this is more of graphical/GIS analysis of runoff and aquifer or ground water system modeling. The fresh water input is important locally for several reasons: it controls breakup of nearshore ice; it may affect timing of release of particulates (or spilled oil, if present) from landfast ice; and it defines the water mass properties and dynamics of the nearshore shelf, particularly within or near barrier islands. This inshore area is the area of highest interest to oil industry.

Changes in the timing and amounts of river runoff to the arctic shelves may have an effect on the circulation. Hydrologic work has been done in the Kuparuk River watershed, but this is a small portion of the entire Arctic coast, and has focused on understanding the fundamental hydrological processes in this smaller watershed.

Objectives The objective of this project is to develop a hydrological model of river runoff that would be incorporated into a general circulation model. The model would incorporate the first order hydrological processes to estimate river runoff into the Arctic Ocean primarily along the Beaufort Sea coast.

Methods

1. Synthesize existing information on hydrological modeling of Arctic watersheds.
2. Quantify first order hydrologic processes along the Alaska Canada Arctic coast from approximately Icy Cape to the McKenzie Delta.
3. Develop hydrological model incorporating first order hydrologic processes.
4. Synthesize existing hydrographic data for model validation.
5. Provide model code and documentation.

Importance to MMS The incorporation of river runoff into a general circulation model is important to advance prediction of the current fields in the nearshore region. Since very few rivers along the Arctic coast have gauges, it is important to develop a physically based hydrologic model that can be used to predict the temporal variation river runoff.

Date Information Required: Data collection will be ongoing and the information will be input to our databases. Starting the model in FY 2005 would allow for the planned incorporation of the model into a potential additional phase of work on the ongoing CMI study of the Beaufort oil spill model, Nowcast/Forecast Model for the Beaufort Sea Ice-Ocean-Oil Spill System. The information will be used in post-lease NEPA documentation for Beaufort Sea Lease Sales in 2003, 2005, and 2007, and DPP's.

Revised date: September 2003

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2004

Region: Alaska
Planning Areas: Norton Basin
Type: Competitive or Joint Funding
Title: Norton Basin Planning Area Circulation and Oil Spill Trajectory Model

Period of Performance: FY 2005-2006

Description:

Background MMS proposes to lease within the Norton Basin Planning Area by an annual nomination process. Although MMS expects the nomination process may result in primarily exploration and production of gas for local use, this expectation does not preclude the need for oil spill risk analysis tools. MMS does not have a functional oil spill trajectory model for the Norton Basin Planning Area. Previous MMS contractors (RAND Corporation and Applied Science Associates) did develop circulation and oil spill trajectory models for the northern Bering Sea and Norton Basin Planning Area in the late 1970's through the late 1980's, but these models are no longer functional, available to MMS, or state-of-the art.

Objectives The objective is to provide MMS with circulation modeling capabilities specific to the Norton Basin Planning Area for use in NEPA assessments. This objective may be accomplished by providing one of the following: ocean circulation fields, a usable in-house circulation model, or in-house stochastic oil spill trajectory or fate (trajectory plus weathering) modeling capabilities/tools.

Methods Develop or adapt existing model(s) to provide ocean surface circulation fields or model suitable for oil spill trajectory modeling for any location in Norton Basin. Model output must be suitable as input to MMS oil spill risk analysis programs.

Importance to MMS The Oil-Spill-Trajectory Model is a cornerstone to regional NEPA analyses and oil-spill-contingency planning. Oil-spill issues constitute half the public comments submitted on EIS's on proposed offshore oil and gas sales in the Alaska OCS Region. Model results are used to evaluate the risks and advantages of specific alternatives, and they are used to fine-tune lease-sale stipulations. The oil industry and MMS use the model results in preparation and review of postlease oil-spill-contingency plans. The Department of State used the older models results to evaluate foreign policy implications of OCS activities. The U.S. Coast Guard has used model results in analysis of local, national, and international oil-transportation and spill-response issues. The Canadian and Alaskan oil industry and spill cooperatives have adapted portions of MMS circulation and trajectory models for their own application, including the placement of spill-response equipment.

Date Information Required: Information from this study will be used in NEPA analysis related to proposed leasing and exploration, development EIS's, and in reviewing oil-spill-contingency plans for Norton Basin Planning Area OCS and coastal facilities. The *Outer Continental Shelf Oil and Gas Leasing Program 2002-2007*, offers the area for nomination annually.

Revised date: September 2003

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2004

Region: Alaska
Planning Areas: Beaufort, Chukchi, and Bering Seas and Cook Inlet
Type: Joint Funding/Interagency
Title: Update Digital Interactive Climatic Atlases

Period of Performance: FY 2005-2007

Description:

Background This study will update and improve existing climatic atlases that will be a decade old. These atlases cover all planning areas in the Gulf of Alaska and the Bering, Chukchi, and Beaufort Seas. Improvements will be made in digital accessibility of data and consolidation of existing data. Although more than a fourfold number of marine data above 65° North Latitude were available in 1987 than for the same area in the 1977 atlas, the data amount remained inadequate to permit a detailed analysis by meteorologists or by computer-contouring routines.

Historical climatic data exist at the National Climatic Data Center in two Comprehensive Ocean Atmosphere Data Set files—file names TD-1170 (1854-1995) and TD 1129 (1980-1995). Both of these files have been updated to December 1995. The MMS has climatic data that have been summarized statistically by month in paper format updated to 1984. The budget for this study assumes 50 percent cost participation by other interested agencies.

Objectives

1. Acquire 1987 digital data presented in climatic atlases (specifically sea surface temperature, wave height, precipitation, wind speed and direction, visibility, and air temperature).
2. Update climatic data to the present, collecting digital climatic data from the National Climatic Data Center, the U.S. Air Force's Environmental Technical Applications Center, and other applicable sources.
3. Synthesize and format climatic data in a relational database similar to hardcopy climatic atlases for digital use in charts, graphs, maps, Geographical Information System (GIS) ArcView and Arc/Info software and word-processing applications.
4. Create the database on CD-ROM for use by other participating agencies, the public and MMS.

Methods This will be a three phase effort. The first phase in the first year will verify the availability of needed digital data sets. Project managers would develop a coordination plan with other interested Federal agencies. If a significant portion of the data is not available in

digital format, then the study will not proceed to the next level of effort unless additional funding is made available. The second phase of the study in the second year will collect previous digital data for the 1987 climatic atlas and update digital climate data to the present. Scientists will apply quality control to the data using both computer and visual techniques to eliminate duplicate observations and questionable elements. Scientists will synthesize the data into monthly data elements previously established in the 1977 and 1987 climatic atlases. The last phase of the study will compile the data into a CD-ROM digital relational database and develop GIS and other graphical tools to analyze and display the data.

This study will provide users' manual, and one- or half-day workshop to demonstrate database and provide user training.

Importance to MMS The primary MMS need is for an electronic rather than a paper climatic atlas. Paper climatic data are no longer fully adequate to meet MMS and other user needs. The data will be used for MMS oceanographic modeling efforts and to interpret the occurrence of biological data collected under the studies plan. MMS analysts use the current paper atlas data in describing the environment and setting the initial parameters for oil-spill-weathering models. MMS and others use the data for oil-spill-contingency planning. Because of potential oil development in nearshore State and OCS waters, both MMS and the State of Alaska are particularly interested in a revised atlas with a comprehensive update of wind data for nearshore areas of the Beaufort and Chukchi Seas.

Date Information Required: There is continuous and increasing need for these data for EIS's and post-lease assessments for all active-planning areas.

Revised date: September 2003

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2004

Region: Alaska
Planning Areas: Beaufort Sea, Chukchi Sea, Hope Basin, Cook Inlet
Type: Competitive
Title: Worst-Case Blowout Occurrence Estimators for the Alaska OCS

Period of Performance: FY 2005-2006

Description:

Background The MMS has used the historical spill record on the Outer Continental Shelf (OCS) primarily as an indicator of future spill occurrence rates on the OCS. These data are supplemented in other ways, for example by engineering and fault tree studies of spill risk. Often as part of environmental assessments, MMS is tasked with providing analysis and probability of what at varying times has been known as a worst case, catastrophic case, large-spill case, or very-large-low-probability case spill. These low-probability statistics cannot be provided by MMS Field Operations or Resource Evaluation offices. In response to this issue, the MMS Technology Assessment and Research Program initiated a study in 2000 to estimate worst case pipeline spills, primarily for the Gulf of Mexico, and considered, but was unable to extend that study to cover blowouts. The study described here will similarly evaluate the probabilities of occurrence of blowouts larger than have ever occurred on the U.S. OCS.

Objectives

1. Derive statistical/engineering procedures to extrapolate occurrence rates for worst case OCS oil blowouts.
2. Develop model/algorithm that would allow desktop PC estimation of blowout size given a probability of occurrence and the probably of occurrence for a given blowout size.

Methods

1. Review existing worst-case blowout examples (probability, size, and basis) from Alaska Region oil spill contingency plans and environmental assessments.
2. Evaluate applicability of alternate approaches against data needs and availability for each approach, considering:
 - a. Geological formation constraints.
 - b. Environmental and geological hazards specific to individual planning areas and more local hazards that may affect size or likelihood of blowouts.
 - c. Potential effect of engineering design on size or likelihood of worst case blowouts.

3. Develop a model that provides blowout size or probability of occurrence, given the other parameter, for very large or worst case blowouts.
4. Coordinate this study with the MMS Technology Assessment and Research Program related studies.

Importance to MMS The Oil-Spill-Risk Analysis (OSRA) is a cornerstone to regional EIS's environmental assessments, and oil-spill-contingency planning. Oil-spill issues constitute a significant portion of public comments submitted on sale or development EIS's in the Alaska OCS Region.

Date Information Required: Information from this study will be used for NEPA pre- and post-lease NEPA documentation for proposed Beaufort Sea Lease Sales in 2003, 2005, and 2007; Cook Inlet Lease Sales in 2004 and 2006; Chukchi/Hope Basin Lease Sale in 2007; and in reviewing oil-spill-contingency plans.

Revised date: September 2003

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2004

Region: Alaska
Planning Areas: Cook Inlet
Type: Joint Funding
Title: Cook Inlet Pollock Migration Study

Period of Performance: FY 2005

Description:

Background The pollock fishery is the most important fishery in Alaska marine waters. Pollock is also an important prey species of other fish and marine mammals. Pollock is a key species in the marine ecosystem at every life stage; it may prey on a species at one life stage and be preyed upon by that species in another life stage.

Shelikof Strait just south of Lower Cook Inlet is the primary spawning location for Gulf of Alaska pollock and also a likely recipient of oil spilled in Cook Inlet off shore oil production and transportation. MMS should assess the potential effects of oil spill on pollock and pollock habitat. Of primary concern is where and in what seasons pollock might be affected by a potential oil spill. Yet very little is known about migrations after the egg stage or the extent to which the Shelikof Strait and Prince William Sound populations are discrete non-mixing populations.

There may be an opportunity to augment ongoing pollock fishery research efforts with new satellite “pop-up” tagging technology to obtain pollock migration information useful to several fisheries management agencies. Being able to use pop-up tag technology would allow tagging of fish during the summer trawl surveys and follow the pollock through to the final life stages to identify where and when they might be potentially affected by oil spills.

The commercial harvest is managed by the North Pacific Fisheries Management Council (of the National Marine Fisheries Service) and the Alaska Department of Fish and Game.

Objectives

1. Evaluate feasibility of using pop-up tags on walleye pollock.
2. Tag and release fish during the biennial trawl test fishery.
3. Download data and analyze migratory movements through the annual cycle.

Methods

Phase I: Try pop-up tags in a controlled environment to estimate mortality rates of tagged fish and evaluate feasibility and possible negative side effects. If Phase I proves successful, then proceed to Phase II.

Phase II:

1. Install tags on fish caught during summer trawl survey.
2. Download data from satellite once pre-programmed tags are released from the fish and pop-up to ocean surface where they beam up their stored data.
3. Analyze times and location of fish to predict potential effects of oil spills.
4. Identify whether stocks remain separate or when and where they may mix.
5. Develop GIS Map layers by season compatible with MMS GIS & oil spill modeling.

Importance to MMS This study will provide information on likely pollock life stages and locations that may be affected by potential oil spills. This information will be used for post-sale NEPA documentation for Cook Inlet Lease Sales scheduled for 2004 and 2006. Information from this study will also be valuable to commercial harvest managers such as North Pacific Fisheries Management Council (of the National Marine Fisheries Service) and the Alaska Department of Fish and Game and to industry research groups such as the Pollock Conservation Cooperative Research Center.

Revised date: September 2003

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2004

Region: Alaska
Planning Areas: All
Type: Joint Funding
Title: Joint Funding Opportunities in Existing Marine Bird or Marine Mammal Studies

Period of Performance: FY 2005-2006

Description:

Background The MMS periodically learns about relatively short-term, partnership opportunities on existing marine bird or marine mammal studies initiated or underway by other agencies. Such proposals range from funding specific aspects of existing studies that are perceived to be of interest to MMS to funding specific products that would be used by MMS analysts. Some of these items address MMS issues and needs or would provide data of use to MMS in GIS and other analyses or data that is considered too narrow in scope to warrant a fully developed/funded MMS study.

Objectives The purpose of this study profile is to establish a mechanism whereby the Alaska Region may enter into joint funding arrangements with other agencies to facilitate the acquisition of needed, small-scale scientific information and/or scientific data on a timely basis.

Methods Joint funding agreements would be arranged through Inter-agency Agreements or Purchase Orders indicating the specific data collection that is proposed for funding by MMS, products that would be delivered (reports, journal articles, digital data), and the agreed funding level. MMS would potentially cost-share up to 25 percent of the total project cost(s).

Importance to MMS Data produced by such study tasks potentially would supply MMS with information needed to address issues that result from late-breaking legal, regulatory or political developments that were nonexistent or unanticipated during the preparation of the relevant MMS study plan. Such developments typically result from initiation of the NEPA process, court actions, publication of proposed and final regulatory rules, or the need to formulate mitigation procedures. Acquisition of issue-specific information in many cases would allow MMS to effectively resolve differing opinions with other agencies without protracted discussion.

Date Information Required: This has no due date, but we recommend the information that would result from funded tasks be available prior to initiation of EIS or other processes associated with future leasing/production in all the active Alaska planning area.

Revised date: September 2003

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ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2004

Region: Alaska
Planning Areas: Beaufort Sea
Type: Joint Funding/Competitive
Title: Bowhead Whale Feeding in the Central and Western Alaskan Beaufort Sea

Period of Performance: FY 2005-2008

Description:

Background An MMS study completed in 2002 estimated the extent to which the bowhead whale population utilizes OCS areas in the eastern Alaskan Beaufort Sea for feeding, as well as this area's importance to individual whales (2002-012). In a 2001 Arctic Region Biological Opinion, National Marine Fisheries Service made a Conservation Recommendation that MMS continue to study "the use of the Beaufort Sea by feeding bowheads and assess the importance of this feeding to the health and well being of these animals." At annual workshops, the North Slope Borough has consistently recommended that MMS expand the scope of the current feeding study to include the entire Alaskan Beaufort Sea. This study would repeat key components of the eastern Beaufort study in order to characterize the importance of feeding habitat in the central and western Alaskan Beaufort Sea.

Objectives The overall goal of the study is to estimate the distribution and relative importance of the central and western Alaskan Beaufort Sea as feeding areas for bowhead whales. Specific objectives for accomplishing this goal include:

1. Estimate time spent by bowhead whales feeding in the central and western Alaskan Beaufort Sea over a 3-year period.
2. Assemble historic data and traditional knowledge on known feeding areas in the study area.
3. Use collected information, historic information, traditional knowledge, and energy budget information collected for the eastern Alaskan Beaufort Sea to estimate the relative importance of the central and western Alaskan Beaufort Sea as feeding areas for bowhead whales.

Methods The study would use methods similar to those used for the previous eastern Alaskan Beaufort Sea bowhead feeding study. The study would focus on analyses of stomach contents at Barrow and Cross Island, behavioral observations by aircraft, plankton tows by small vessel, radio isotope ratios in baleen annuli, fatty acid comparisons, recording of traditional knowledge, and computer modeling of feeding information. Real-time distribution of whales in the Beaufort Sea, as well as historic information on bowhead whale feeding activity in the study area, would

be provided by the ongoing MMS “Bowhead Whale Aerial Survey Project.” Scientific information collected would furnish inputs to a model similar to that used to estimate the importance of the eastern Alaskan Beaufort Sea as a feeding area for bowhead whales. Scientific permits would be obtained for all fieldwork. The study would be carefully coordinated with the Alaska Eskimo Whaling Commission and Whaling Captains Associations in Barrow and Nuiqsut to avoid interference with fall subsistence hunts and, where feasible, to involve whaling communities in the conduct of the study.

Importance to MMS With additional information on the importance of the study area to feeding bowhead whales, alternative mitigation options for future Beaufort Sea lease sales may be feasible. Also this study addresses a Conservation Recommendation in National Marine Fisheries Service’s 2001 Arctic Region Biological Opinion that MMS study “the use of the Beaufort Sea by feeding bowheads and assess the importance of this feeding to the health and well being of these animals.”

Date Information Required: Information on the importance of the central and western Alaskan Beaufort Sea as feeding areas for bowhead whales is needed for post-lease permit approvals for all Beaufort Sea sales. The information also needed for post-lease NEPA documentation for the proposed Beaufort Sea Lease Sales in 2003, 2005 and 2007, and DPP’s.

Revised date: September 2003

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2004

Region: Alaska

Planning Areas: Beaufort Sea, Chukchi Sea

Type: Joint Funding/Interagency

Title: Influence of Climatic and Environmental Factors on Polar Bear Distribution and Abundance on the North Slope of Alaska During the Fall

Period of Performance: FY 2005

Description:

Background During the past 10 years there has been an increasing trend for significant numbers of polar bear to occupy and use coastal habitats of the Beaufort Sea for loafing and feeding. The period of increased utilization is during the fall open water and early freeze up period. Industry reports and monitoring data from the Prudhoe Bay area, resident reports from Kaktovik, Barrow, and Nuiqsut (Cross Island), and aerial surveys of a portion of the central Beaufort Sea that will be concluding this year confirm the trend. During the fall of 2002 approximately 150-200 polar bears were present along the coast and barrier islands. Additional bears were present on the coast from Barrow west to Icy Cape. The numbers may represent approximately 10% of the total population and are significant. These bears arrived months prior to formation of annual pack ice and were stranded on land for up to eight weeks. Several bears had to be killed in Barrow and Prudhoe Bay for human safety reasons. Potential factors contributing to the apparent shift in distribution of polar bears in this area at this time of year are not fully understood but may include: climate change, environmental/physical oceanographic factors associated with the development and position of pack ice, and attraction and fidelity of polar bears to bowhead whaling carcasses.

Polar bears are an important international resource, and jointly managed under international treaties and agreements that include circumpolar countries such as the United States, Canada, Russia, and others.

Objectives To estimate the distribution and abundance of polar bears in the vicinity of coastal Alaska in the Southern Beaufort Sea and Eastern Chukchi Sea area, and intra-annual factors influencing their distribution and abundance.

Methods

1. Conduct weekly low level aerial surveys along the barrier islands, shoreline, and ice habitat from approximately September 15th to October 30th, for four years. The area will include the shoreline from Icy Cape to the Canadian border.
2. Acquire ice coverage and environmental data including data on ambient temperatures and

daily/weekly winds for the study area.

3. Analyze and model the relationship between ice and environmental data to polar bear distribution and abundance.

Importance to MMS Oil and gas activities are occurring in the Beaufort Sea region and leasing activities are planned for the Chukchi/Bering Seas region. Mounting evidence indicates that climate and environmental change is occurring in the Arctic. Effect of climate change on marine systems is poorly understood. Federal and state lease sale stipulations in environmental impact assessments for oil and gas operations rely on an accurate assessment of the effects of the activity. This study will help estimate when bears utilize coastal habitats at critical times of year when they are vulnerable to potential effects from an oil spill, and would allow for greater accuracy in assessing potential impacts from a spill. Also, a greater understanding of the role of environmental factors on bowhead whale carcasses and annual shifts in distribution and abundance potentially associated with global climate change and any potential mitigation measures would be obtained. Measures to decrease impacts of human activities on polar bear habitat and to minimize human interactions with polar bears can then be more effectively integrated into project planning.

Results of this study would also be used by agencies and subsistence organizations for polar bear management decision making, including U.S., Canada, Russia, and other national authorities.

Date Information Required: This information is needed for post lease NEPA documentation for proposed Beaufort Sea Lease Sales in 2003, 2005, and 2008, and DPP's.

Revised date: September 2003

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2004

Region: Alaska
Planning Areas: Cook Inlet
Type: Competitive
Title: Collection of Traditional Knowledge of the Cook Inlet and Shelikof Strait

Period of Performance: FY 2005-2006

Description:

Background Native peoples of Alaska have populated the coastal environments of Cook Inlet and the Shelikof Strait for centuries, accumulating much knowledge about the biological and physical environment of both the marine and terrestrial ecosystems. Most of this knowledge has been passed on from one generation to the next by word of mouth. Only a fraction of it has been systematically recorded, and even less has been indexed. Much is unavailable to the scientific community, even as public input increasingly urges government agencies to incorporate traditional knowledge in their documents.

This Cook Inlet study will follow upon the completion and evaluation of a similar project entitled “Collection of Traditional Knowledge of the Alaska North Slope.” That study is expected to yield insights regarding the process of documenting traditional knowledge and will inform the design of the Cook Inlet study. Most notably, these include a sharper understanding of 1) the varieties of traditional knowledge that must be distinguished to achieve validation through independent corroboration and internal consistency; 2) the field methods that are appropriate for the systematic compilation of traditional knowledge; and 3) concerns of communities that must be addressed. Within these parameters, traditional knowledge can be used to guide scientific research on OCS impacts by identifying key locations and processes that inform hypothesis testing and focus sampling programs.

Objective To create an indexed annotated bibliography and abstracts of recorded traditional knowledge sources.

Methods

1. Work with community elders, Native villages, and subsistence coordinators with Native organizations to identify traditional knowledge sources and statements appropriate for inclusion in the traditional knowledge database.
2. Include in the traditional knowledge database, at a minimum:
 - a. Subsistence areas.
 - b. Harvest methods.
 - c. Relationships between the physical environment and animal populations and behavior.

- d. Marine mammal behavior, movement, and distribution.
 - e. Ice conditions and movement.
 - f. Wind and current patterns.
 - g. Place name information.
3. Locate, collect, and organize all “traditional knowledge” information associated with Cook Inlet, including:
 - a. Oral history taped interviews.
 - b. Written transcripts.
 - c. Published sources.
 - d. Textual and video records of CD-ROM “jukeboxes” of elder interviews.
 - e. Textual and video records of elders’ conferences.
 4. Identify key traditional knowledge indices for structuring and abstracting.
 5. Prepare an annotated bibliography, abstracts, traditional knowledge indices, and findings of this study on a PC-based CD-ROM and for mounting on the MMS, Alaska OCS Region’s website.
 6. Distribute the CD-ROM to Native communities, local governments, State of Alaska, and Federal agencies involved in environmental research and assessment.

This project will be implemented in two phases. Phase I will establish a prototype and populate it with preliminary sources. MMS will review the Phase I product, evaluate its value as a source of traditional knowledge, and recommend revisions to the structure. The Contractor will assess the number of sources remaining that have potential value for addition to the collection in phase II and the cost for adding them to the collection. If MMS finds that the collection is of value in Phase I, it will propose proceeding with Phase II.

Importance to MMS This database will help MMS better address Executive Orders on Government-to-Government consultation and Environmental Justice and facilitate incorporation of Native stakeholder comments in planning, analysis, and decision-making processes.

Date Information Required: For post-lease NEPA documentation for Cook Inlet Lease Sales in 2004 and 2006, and DPP’s.

Revised date: September 2003

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2004

Region: Alaska
Planning Areas: Beaufort Sea and Chukchi Sea
Type: Joint Funding/Competitive
Title: Sociological and Visual Documentation and Analysis of the Bowhead Whale Subsistence Hunt

Period of Performance: FY 2005-2006

Description:

Background The Beaufort Sea bowhead whale subsistence hunt has a centuries-long history and continues to be an important organizing feature of life in Alaskan North Slope villages. The technology with which the hunt is implemented is continually changing, but its basic aspects and associated social practices have remained relatively constant over time. Meanwhile, various other aspects of North Slope life have changed dramatically during the last century. These changes relate to large-scale sociopolitical and economic events and processes, with implications for the whale hunt. Examples include institution of Alaska Native Claims Settlement Act, the International Whaling Commission and its quota system, and the arrival of oil industry and associated revenue.

Modern Iñupiat hold fast to traditional subsistence practices amidst the many influences of modernity. The whale hunt arguably is the most important of these practices. Modern-traditional dynamics related to the hunt constitute an area of research relevant to OCS decision-making processes. MMS is addressing perceptual aspects of such issues with survey-focused research. This sociological study will complement that work to enable further analysis of these important issues. A well-defined and germane focus for the study will derive from key findings of the MMS study titled “Quantitative Description of Potential Impacts of OCS Activities on Bowhead Whale Hunting Subsistence Activities in the Beaufort Sea.”

Objectives The objective of this study is to provide an sociological and visual documentation of the subsistence whale hunt as a baseline for impact analysis and, possibly, orientation for oil and gas industry workers active in the Beaufort Sea OCS Planning Area.

Methods The project will employ sociological and visual documentary methods to describe the subsistence whale hunt, explain its importance, and disseminate that analysis through film or video. A mix of project planning and social science research methods will be required as follows:

1. Identify a topical focus for the study. This should involve review of previous MMS research including the study titled “Quantitative Description of Potential Impacts of OCS Activities on Bowhead Whale Hunting Subsistence Activities in the Beaufort Sea,” and key person

interviews with Alaska Eskimo Whaling Commission leaders, whaling association leaders, and village elders.

2. Effectively interact with North Slope institutions, leaders, and residents to complete a sustained period of sociological observation in the community of interest. Use participant observation, non-reactive, and interviewing methods to document the hunt and associated practices.
3. Based on the data collected in (2) above, describe the modern whale hunt, including associated observed and expressed problems, challenges, and rewards given modern economic/cultural influences.
4. Develop a comprehensive explanatory analysis of the data gathered in (2) above and factors described in (3) above. The analysis should effectively address the topical focus identified in (1) above.
5. Use state-of-the-art film technology and expertise to document those aspects of the whale hunt and associated social practices directly relevant to the analysis outlined in (3) above. The investigators will have achieved rapport with the hunters and deep familiarity with the subject matter and analysis through the many months of previous involvement in the project.
6. Edit and compile film footage to produce a film or video documentary of the whale hunt, associated practices, hunter narratives, and analysis of the challenges, rewards, and social implications of bowhead whale subsistence hunting in 21st century Alaska.

Importance to MMS MMS also can use the products of this study to address OCSLA requirements, assist NEPA-document preparation, review oil-spill-contingency plans, facilitate outreach with North Slope communities regarding the MMS program, and review and formulate offshore policy for Alaska. Another possible use of this study is to make results available to industry companies for use in stipulated orientation programs.

Date Information Required: This information is needed for NEPA pre- and post-lease documentation for proposed Beaufort Sea Lease Sales in 2003, 2005 and 2007, and DPP's.

Revised date: September 2003

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2004

Region: Alaska
Planning Areas: Beaufort Sea
Type: Competitive or Joint Funding
Title: Mapping of Ice Gouge and Strudel Scour Density for the Beaufort Sea Utilizing Existing Data

Period of Performance: FY 2005-2006

Description:

Background Quantitative information on ice gouge and strudel scour are sparse to non-existent in the Beaufort Sea. Ice gouge data was last collected on a regional basis over twenty years ago when instrument and navigation quality was less accurate than current technology. MMS has reviewed all of the available ice gouge and strudel scour data for site-specific surveys and development surveys in the Beaufort Sea. We have established that there are insufficient interpreted data to predict the occurrence, extent and magnitude of these features. In addition, we do not know the relationship between overflood limit and the occurrence of strudel scour over most of the nearshore portions of the Beaufort Sea where offshore oil and gas pipelines may be located in the future. The data sets associated with magnitude of the occurrence of ice gouge and strudel scour are critical in the evaluating the degree of risk associated the building of pipelines to offshore fields in the Beaufort Sea.

These data tie into other recently collected site survey and development pipeline surveys compiled in the MMS Sub-sea Physical Environmental Database (SPED) for the Beaufort Sea. This study did not analyze existing MMS geophysical records present for quantitative data on ice gouge or strudel scour. There is a new proposal to collect ice gouge and strudel scour data for the proposed natural gas pipeline in the Beaufort Sea. These data, if collected, would be incorporated into the current database and analysis effort.

Objectives

1. Estimate the density and degree of severity of ice gouging for all of the site-specific surveys in the Beaufort Sea utilizing the available MMS geophysical seismic records.
2. Map the strudel scours found within the site-specific surveys with MMS geophysical records (few if any).
3. Incorporate the new information into the SPED for the Beaufort Sea, Alaska.
4. Estimate the ice gouge density across the Beaufort Sea Shelf based upon the mapped ice gougues and bathymetry.

5. Estimate the statistical significance between ice gouge intensity, bathymetry and sea ice severity.
6. Update the current Graphical User Interface for the analysis of ice gouge, strudel scour (if observed) as they relate to bathymetry, and the concentration of sea ice.
7. Update the database documentation and data loaders.
8. Describe the methods for the collection and analysis of the data.

Methods

1. Map the density and magnitude of ice gouges for the Beaufort Sea using the available MMS geophysical seismic records and data.
2. Incorporate data into the current SPED.
3. Provide new tools within to query the newly established data.
4. Compare the occurrence of ice gouge to water depth and to the magnitude of sea ice using statistical methods.
5. Describe the methodology to analyze the data.
6. Provide final database, database documentation and database design based upon Coastal Offshore Resource Information System (CORIS) standards.

Importance to MMS This information will be used for future EIS's in the Beaufort Sea and post-lease NEPA documentation. The information is needed to fill data gaps in our understanding of the occurrence and intensity of ice gouging in the Beaufort Sea. MMS and industry will be able to update understanding of ice gouge intensity, for review of potential pipelines, such as for the proposed natural gas pipeline and for possible scenarios associated with Kuvlum and Wild Weasel prospects. These data may also be used by MMS and industry to estimate risk associated with the development of pipelines from shore-based facilities.

Date Information Required: The interim and final information from this study will be used for NEPA pre- and post-lease NEPA documentation for proposed Beaufort Sea Lease Sales in 2003, 2005 and 2007, and DPP's.

Revised date: September 2003

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2004

Region: Alaska
Planning Areas: Beaufort Sea
Type: Competitive
Title: GIS Internet Map Server (ARCIMS) Web Site for the MMS Sub-sea Physical Environmental Database (SPED)

Period of Performance: FY 2005

Description:

Background The Sub-sea Physical Environmental Database (SPED) for the Beaufort Sea, Alaska OCS Region is a compilation of all the available sub-sea environmental features. These features include the navigation, bathymetry, isopach, structure, strudel scour, ice gouge, shallow gas, Boulder Patch and borehole data. The oil and gas industry collected these data for site-specific exploratory well surveys and for the pipeline surveys over the last twenty years. The data are stored within an ArcView/Access database and accessible by all MMS analysts. These data are very useful to those companies who would want to participate in an oil and gas lease sale in the Beaufort Sea but are unfamiliar with the specific drilling and pipeline hazards there. The oil and gas industry may also utilize these data to plan for proposed pipeline surveys on their existing units or leased areas. Current companies planning large projects in the Beaufort Sea such as the proposed Natural Gas Pipeline Project can utilize these data products for planning and comparison purposes. Universities and international organizations can utilize these data for planning future research in the Beaufort Sea (e.g., currents, permafrost, etc.).

A Web-enabled GIS database and descriptive database is needed in order to provide important technical information to the oil and gas industry about potential geologic hazards pertaining to drilling and pipeline construction for the Beaufort Sea. The GIS Internet Map Server (ARCIMS) is an internet mapping software developed by Environmental Systems Research Inc. (ESRI). ESRI software will be used to query spatial information across the Beaufort Sea Shelf for any site-specific survey or pipeline survey done within Federal OCS waters. The database will be stored as ACCESS tables and as ArcView shapefiles. MMS will provide the necessary tools so that the public including industry can query the content of the database. This dynamic database will be updated, as new data becomes available

Objectives

1. Provide internet mapping capability within the Alaska OCS Region for SPED.
2. Provide access to the existing geohazard and geotechnical reports found in SPED.

3. Provide query tools with ARCIMS to query the available information contained with the SPED.

Methods

1. Compile the currently available information from the SPED and link the data to ARCIMS software for serving the data over the MMS web site.
2. Scan and convert to portable document file (PDF) the hard copy reports for the Beaufort Sea site-specific surveys, Boulder Patch Surveys, pipeline route surveys, and borehole surveys.
3. Link the spatial information from SPED to the hard copy documents of PDF files.
4. Establish query routines within ARCIMS to extract spatial information from the SPED and descriptive information from the site-survey and pipeline reports in PDF files.
5. Provide user documentation online.

Importance to MMS The MMS customer base of the oil and gas industry, government agencies, universities, the public and other potential customers will be connected to the most comprehensive database on oil and gas drilling and pipeline hazards database for the Alaska, Beaufort Sea. The ARCIMS and SPED will provide important decision making information to the oil and gas industry both within and outside Alaska. This information will provide quantitative ocean bottom and sub-bottom geophysical and geotechnical data to the oil and gas industry currently working in the Beaufort Sea and to those companies that may be planning to do so in the future. The geophysical information is shallow gas, shallow stratigraphic, structural, earthquake, etc. The geotechnical information is shallow borehole data on permafrost, sediment type, etc. Connecting the SPED to our customer base will provide them with better decisions making tools which will affect their future participation in the Beaufort Sea, whether it would be for future oil and gas activities, for research, or for other purposes.

Date Information Required: The ARCIMS database and SPED will provide information for pre-and post-lease NEPA documentation for proposed Beaufort Sea Lease Sales in 2003, 2005 and 2007, and DPP's.

Revised date: September 2003

SECTION 3.0 Topical Areas for FY 2006

This section presents a general forecast of significant topical issues and concerns to be addressed by proposed studies for FY 2006 and beyond. In general, these topics conform with the research themes of the NSP. Due to the great differences existing between Alaska environments and other OCS areas, the uniqueness of issues in Alaska have dictated the need to anticipate new topical areas for needed implementation within the Alaska ESP. These projects will focus on MMS mission needs within the context of increasing industrial development and potential trends in changing climates. Specific geographic emphases are likely to change due to potential changes in leasing or development schedules.

Many of the studies proposed for FY 2004 and FY 2005 address the topical areas described below. These will be re-assessed as part of the FY 2005 planning process.

Offshore production started at Northstar in 2001. Industry proposes exploration in the Beaufort Sea and may propose development projects. MMS proposes numerous lease sales in the Alaska OCS in the *Final Outer Continental Shelf Oil and Gas Leasing Program 2002-2007*: 3 in the Beaufort Sea; 2 in Chukchi/Hope Basin; 2 in Cook Inlet/Shelikof Strait; and 1 in Norton Basin. For these reasons, it will be important to continue monitoring studies and other priority studies of key species and marine communities. Monitoring of bowhead whales will continue, and additional studies may be brought online which address ringed seals, kelp communities, fishes and migratory waterfowl. Studies will vary from description of behaviors and habitat to monitoring for changes. Additional studies of the physical environment such as current regimes and ice characteristics will be proposed to support interpretation of data from living resource investigations and to provide a better understanding of the fate and dispersion of OCS discharges.

3.1 Physical Oceanography

One of the emerging issues in the Alaska OCS Region, is the need for better, finer scale circulation and oil-spill models and higher resolution data for the nearshore portions of the Beaufort Sea. Multiple offshore oil fields have been developed (Endicott and Northstar), exploration efforts are accelerating, and development plan potentially can be submitted. MMS will be completing a nearshore Beaufort Sea ice-ocean circulation model in 2003. One goal is further development of this model into a nowcast/forecast ice-ocean-oil spill system for the nearshore Beaufort Sea.

Construction of such a system requires formation of a user group, higher data density, and ability to assimilate such data into the model in real-time. The Region will be working toward forming a users group to provide surface radar mapping capabilities and data for the nearshore Beaufort Sea and other Alaskan waters as needed. Over the past 25 years, oceanographic radar techniques have been developed and improved to the point

that detailed, grided, 2-dimensional maps of surface circulation can be provided and recorded in real time and directly assimilated into real-time models.

Additional improvements will also be needed in sea-ice aspects of the modeling. The resolution of ice models and ice data needs to be increased to address the fine scale interactions necessary to model oil spill trajectories in the nearshore Beaufort Sea and Chukchi Sea, including within and among the barrier islands. Ice models currently in use by MMS and others use relatively simple thermodynamics and ice thickness distribution, approximating the ice as slabs of a one to few thicknesses plus open water. While sufficient as a first approximation of the arctic ice pack, this treatment lacks the ability to sufficiently resolve the spectrum of ice thickness from thin new ice to thick-ridged ice to landfast ice. In addition, these ice models are based on empirical ice physics valid at a 100-km scale and extrapolated to smaller grid dimension. The MMS will work to improve the state of the art in ocean-ice modeling and to produce either a stand-alone model or one that can be coupled to and or nested in existing ice/ocean models.

3.2 Fate and Effects

The Region has collected baseline biological and chemical monitoring data in the vicinity of the Liberty Prospect and Northstar as part of the study Arctic Nearshore Impact Monitoring in the Development Area (ANIMIDA). The summer of 2002 was the last full field season for ANIMIDA. With Northstar in production and the potential for other developments being proposed, there will need to be a follow-on monitoring effort to quantify construction and develop effects. The Region has initiated a continuation of ANIMIDA for FY 2003-2008. The frequency of sampling will probably be less than in the original years of the ANIMIDA project. BPXA put its plan for developing the Liberty Prospect on hold in January 2002. It was the first oil development proposed for OCS waters in Alaska. However, collecting information at this site is useful for the long term monitoring continuity. Developments are possible at this site or others in the central Beaufort.

In addition to site-specific monitoring, there is a need to re-examine the regional pollutant levels in the U.S. Beaufort Sea. The MMS set up the Beaufort Sea Monitoring Program (BSMP) in the 1980's to monitor sediment quality. The BSMP monitors trace metal and hydrocarbon levels in sediments and benthic biota at specific locations on a regional basis. The ANIMIDA program has resampled BSMP stations locally near Northstar and Liberty, but not elsewhere. Regional BSMP sampling has not been done since 1989 and needs to be repeated.

The International Arctic Marine Assessment Program (AMAP) has recommended that additional chemical compounds be included in Arctic monitoring programs because of their increasing levels. Because of AMAP recommendations and other issues, mercury and persistent organic pollutants are likely to be added to the BSMP analyte list.

3.3 Sea Bed and Sub-sea Bed Physical Processes

MMS has reviewed all of the available ice gouge and strudel scour data for site-specific surveys and development surveys in the Beaufort Sea. We have established that there are insufficient interpreted data to predict the occurrence, extent and magnitude of these features. In addition, we do not know the relationship between overflood limit and the occurrence of strudel scour over most of the nearshore portions of the Beaufort Sea where offshore oil and gas pipelines may be located in the future. The data sets associated with magnitude of the occurrence of ice gouge and strudel scour are critical in the evaluating the degree of risk associated the building of pipeline to offshore fields in the Beaufort Sea. These data tie into other recently collected site survey and development pipeline surveys compiled in the MMS Sub-sea Physical Environmental Database (SPED) for the Beaufort Sea.

The SPED should be updated with the remaining shallow core data for the Beaufort Sea Continental Shelf. The shallow core data are very important for understanding the shallow shelf stratigraphy, surface sediment types, location of permafrost, the velocity of sediments, existence of shallow gas, and for the identification of archeological sites.

In the south-central part of Cook Inlet, under 60 to 90 meters of water, lies a vast blanket of sand, sculpted into large sand waves, up to 15m in height and 1 km in wavelength. Previous studies (Whitney et al., 1979, and Whitney et al., 1980a and 1980b) showed by precision comparison of side scan sonar and seafloor profiles collected 4 and 5 years apart over the exact same locations that these large features had not moved. Confirming or denying the static nature of these features by comparing their structure over a longer time period may add to the knowledge of bottom currents in lower Cook Inlet near both the entrance to Shelikof Strait and to Kennedy and Stephenson Entrances.

3.4 Endangered and Protected Species

Production at the Northstar site and OCS activities possible at other sites may lead to risks of oil spills from buried pipelines, other discharges, noise from various industrial and support activities and increased human interaction with arctic offshore species. Species protected under the Endangered Species Act (ESA), Marine Mammal Protection Act, and Migratory Bird Treaty Act are of particular concern if impacted by such factors. Study of the effects on endangered marine mammals, and the need for continued monitoring of fall bowhead whale migrations are expected to be continued – especially research on how any changes in the bowhead whale migration's distance from shore could relate to subsistence success (see below). Future bowhead studies are expected to continue to explore use of satellite tagging for information on bowhead whale residence times in development areas and information on bowhead behavior in response to industrial noise. Also needed will be continuation of vital region-wide fall monitoring of the migration by the MMS Bowhead Whale Aerial Survey Project (BWASP) and additional knowledge it obtains on bowhead feeding patterns.

Effects of construction activities on polar bears, especially on denning bears and concerns about the adequacy of information about all age/sex categories of the bear population will need to be addressed by additional research. Several ongoing studies are expected to lead to recommendations for additional information regarding polar bears and continued study of the bear population's vulnerability to oil spills through improved models.

Also, research on waterfowl migration corridors across the Beaufort nearshore zone will be needed to better define migration corridors and improve impact mitigation. For example, offshore structures constructed in migratory corridors would increase waterfowl collisions with such structures. Of concern are endemic eider species, old squaw, and other waterfowl.

Other key subsistence species potentially exposed to short-term or cumulative impact factors include beluga whales, ringed seals, and bearded seals for which behavioral or monitoring studies will be needed.

3.5 Waterfowl in Lower Cook Inlet

Information on waterfowl abundance and species composition in predominant bays of Lower Cook Inlet is needed. A study by the U.S. Geological Survey identified the Upper Cook Inlet as an extremely important migration and wintering area for shorebirds. Major portions of the Western Sandpiper, Dunlin, and Rock Sandpiper populations either migrate through or winter in Cook Inlet, and at least four major bays in the Upper Cook Inlet qualify as Western Hemispheric Shorebird Reserve Network sites. Assessing the relative importance of bays in the Lower Cook Inlet will compliment the previous study and improve evaluation of potential impacts of oil and gas exploration, development and production.

Steller's eiders, common eiders, surf scoters, white-winged scoters, black scoters, long-tailed ducks, and harlequin ducks all winter, stage, or molt in lower Cook Inlet marine habitats. Steller's eiders are listed as a threatened species and population estimates for long-tailed ducks, scoters, and common eiders are also indicating long-term declines. Causes of these declines are unknown. Winter and spring survey data in lower Cook Inlet is incomplete and sporadic. Distribution and abundance information is needed to better evaluate risk to populations or habitats from oil and gas activities, to better evaluate species status population trends, and to further understand causes of declines. MMS can also use such information for oil spill contingency planning, establishing baseline information for long-term monitoring and mitigation planning, and establishing survey protocols for long-term monitoring.

3.6 Effects on Unique Marine Benthic Communities

Pipeline construction and other activities may generate sediment plumes that could potentially impact the unique "Boulder Patch" benthic community, known to cover an extensive area to the northwest of the Liberty site in Stefansson Sound. This is a boulder-strewn seabed area with a kelp-dominated community. Similar areas are known to exist

to the east in Camden Bay. Some kelp plants in the Boulder Patch are up to 40 years old. Ongoing studies in the ANIMIDA project are studying kelp productivity and will use inherent optical properties of ice and water to estimate the potential effect of sediment resuspension on kelp productivity. Optical-related measurements will include spectral irradiance, light scattering coefficients, and total suspended solids. Results of this work will be used to formulate future information needs related to this issue. Research on invertebrate and vertebrate components of this community and refined development of monitoring protocols are anticipated for the future.

3.7 Marine Fish Migrations, Recruitment and Essential Fish Habitat

Nuiqsut villagers are concerned that OCS activities have affected arctic cisco populations in the Colville River and reduced subsistence utilization. Data in recent years has been spotty due to the completion of relevant causeway studies. Until more consistent time-series data regarding wind-driven recruitment of young-of-year arctic cisco and recruitment of that population are available, offshore oil and gas development could be considered the potential impact-causing factor. Thus, additional research on near-shore arctic fisheries and recruitment to Colville River populations should be initiated.

Proposed and recent pipeline construction in the Beaufort nearshore have led to concerns about effects of trenching and back-filling on fish populations and habitats. Several important fish species used for subsistence migrate through or are found in the Northstar and Liberty areas, including arctic and least cisco, Dolley Varden char, and humpback and broad whitefish. Also, intermittent occurrences of pink and chum salmon may be found in Beaufort coastal waters. As a result of the Magnuson Fishery Conservation and Management Act, Beaufort waters are considered as Essential Fish Habitat (EFH) for endemic salmonids. Future research establishing the significance of salmonid reproduction in drainages to the Beaufort sea may be necessary in order to clarify environmental assessment and mitigation needs.

3.8 Biotechnology Potential

One day soon the search for oil and gas on the OCS may be joined by the search for genetic and biochemical resources found in marine organisms. Such materials could one day lead to new therapeutic drugs for fighting cancer, AIDS or heart disease. Many DOI bureaus are coming to terms with the possibility of locating, conserving, and licensing the natural products of their trust resources.

The MMS has had a long history of studying the ecology of platforms and currently the MMS Gulf of Mexico and Pacific Regions are conducting studies through their CMI's to examine the availability and distribution of bioharvestable marine organisms on OCS structures. Thus far, several "candidate" organisms producing possible therapeutic natural products have been identified. One candidate organism, the bryozoan, *Bugula neritina*, lives in the Gulf and potentially could be commercially harvested from OCS platforms. This organism produces a chemical, Bryostatin 1, which is in Phase II trial testing as a treatment against non-Hodgkin's lymphoma and chronic leukemia. If OCS platforms can

be shown to be a ready source for this organism, then MMS may be dealing with this emerging issue in a significant way. As these MMS Gulf and Pacific Regional studies progress, the Alaska OCS Region may consider whether similar research efforts should be initiated.

3.9 Subsistence

Residents of the North Slope coastal communities frequently express concern about cumulative impacts of offshore and onshore developments on their subsistence lifestyle. The villages of most concern are Kaktovik, Nuiqsut, and Barrow. Consideration of cumulative impacts is an increasingly important issue from a legal standpoint for MMS in preparing NEPA documents. Some of the concerns of the Inupiat are access to hunting and fishing areas being limited by oil industry infrastructure, reduced harvests, increased hunter efforts, and increased hunter cost. How and to what degree subsistence activities have been affected over the last 10 years or so by industry infrastructure and industry activity should be studied.

Related to the long-term study of the cumulative effects of oil industry on subsistence is a broader set of issues of how the Inupiat society has been potentially affected. Aspects such as how the cash component of households affects participation in subsistence activities, stress, sharing of subsistence resources and participation of younger Native in subsistence compared to their elders. Social indicators should be studied to serve as a basis for estimating long-term cumulative impacts.

3.10 Socioeconomic Change on the North Slope

The North Slope has undergone tremendous economic change since the advent of the oil developments centered at Prudhoe Bay in the late 1960's. The North Slope Borough (NSB) was formed in the early 1970's. Its formation enabled the permanent Inupiat residents of the North Slope to levy a tax on the industrial improvements at Prudhoe Bay. The taxes have financed considerable public facilities including schools and sewer and water facilities in the NSB. They have also financed many jobs with the North Slope Borough thus expanding job opportunity that otherwise would not have been there. Since the beginning of production at Prudhoe Bay in 1978 the long range forecast was for a decline in production within 20 years. The NSB has been aware of the potential decline in property tax revenues on the oil industry infrastructure for some time since its inception.

Running counter to this decline may be extraction of gas from the North Slope to provide increasing demand in the Lower 48 states. In the year 2000 private companies initiated feasibility studies for construction of pipelines from Prudhoe Bay to Calgary, which would connect with the pipeline system in the Lower 48. This would require substantial industrial infrastructure, which forms the tax base for the NSB. The extent to which these proposals would stabilize the NSB tax base is not certain. Even though the gas development proposals are in the offing, the tax revenue future for the NSB is uncertain

and could have significant adverse effects on its economy and residents. This should issue should be studied.

3.11 Natural Gas Pipeline

One of the routes for the natural gas pipeline being considered by industry is from Prudhoe Bay, northward to about 4 miles offshore, eastward 300 miles, then southward along the Mackenzie River, and finishing at Calgary, Alberta. Most of the offshore portion would be on the US OCS. (The other major alternative is onshore.) If the preferred route is on the OCS, MMS would be responsible for issuing permits. A buried gas pipeline (as opposed to an oil pipeline) under the seafloor of the Beaufort Sea is a new issue. If the Beaufort OCS is the preferred route, the Alaska Region may need to conduct environmental studies on a variety of environmental issues.

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