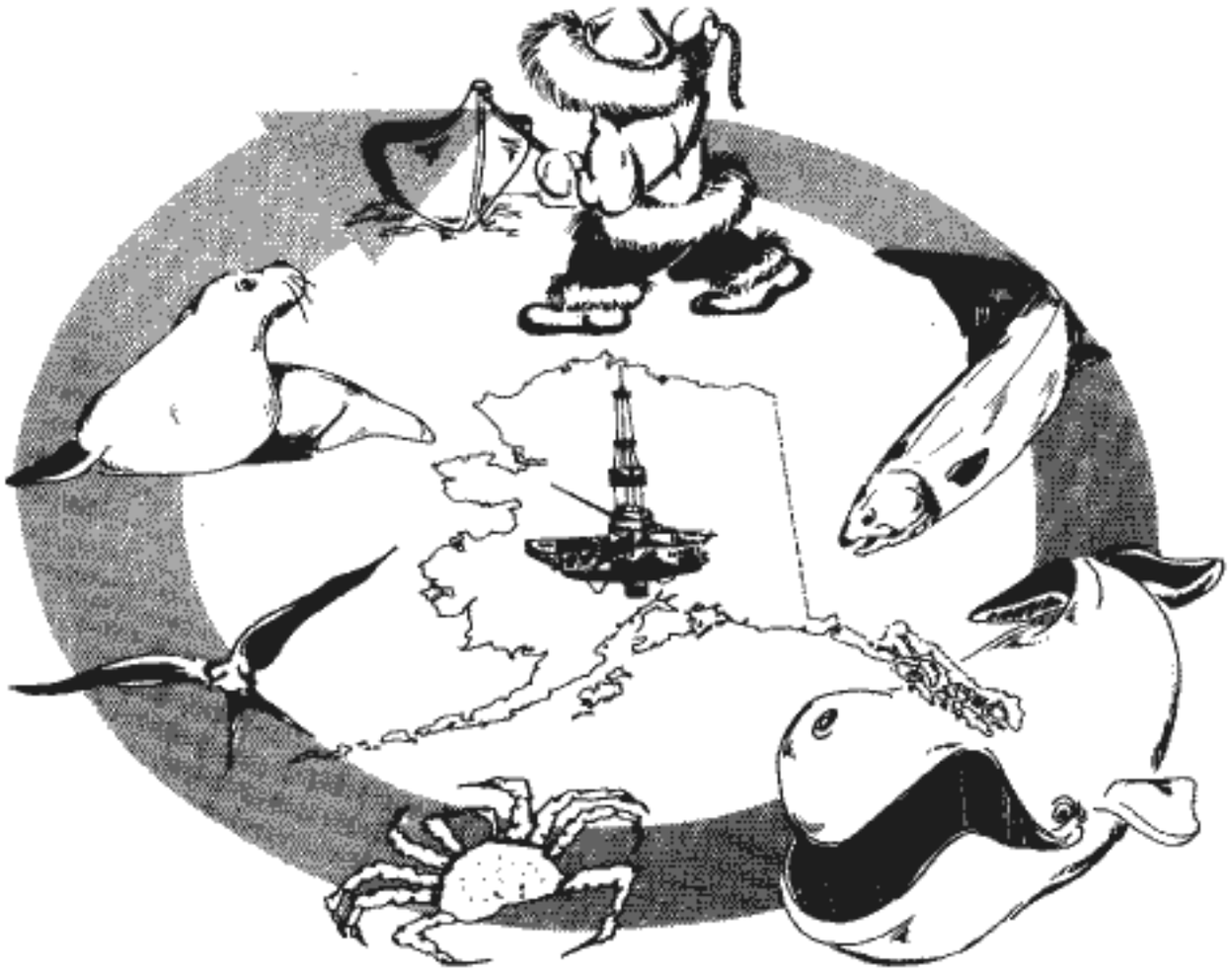
Alaska Outer Continental
Shelf Region

Alaska Annual Studies Plan
Final FY 2002-2003



MMS U.S. Department of the Interior
Minerals Management Service
Alaska Outer Continental Shelf Region

Prepared by
U.S. Department of the Interior
Minerals Management Service
Alaska Outer Continental Shelf Region
949 East 36th Avenue, Room 308
Anchorage, Alaska 99508-4363

January 2001

For copies of this document, please contact Tim Holder at (907) 271-6625 or by email, Tim.Holder@mms.gov, or access electronically at http://www.mms.gov/alaska (click on Environmental Studies Section).

The inclusion of studies proposed in this document does not constitute a commitment by the U.S. Department of the Interior, Minerals Management Service, to conduct or fund any or all of the studies. The scope of the studies is subject to change prior to initiation of any work.

Any use of trade names is for description purposes only and does not constitute endorsement of these products by the Minerals Management Service.

g:\...ess\sp02\FinalFinal\Parts\PartsNo$\
front cover.cdr
Inside Front Cover.doc
Toc.doc
Figures 1,2,3,4
Section1.doc
Section2.doc

The contents on this page are linked to the appropriate page in the document. Click on the item to jump to the page.

TABLE OF CONTENTS

The contents on this page are linked to the appropriate page in the document. Click on the item to jump to the page.

SECTION 2: Study Profiles

The contents on this page are linked to the appropriate page in the document. Click on the item to jump to the page.

Part A. Approved Studies (Continued)

Social Science and Economics

The contents on this page are linked to the appropriate page in the document. Click on the item to jump to the page.

Part A. Approved Studies (Continued)

Other

The contents on this page are linked to the appropriate page in the document. Click on the item to jump to the page.

The contents on this page are linked to the appropriate page in the document. Click on the item to jump to the page.

Part B. Proposed Studies (continued)

Social Science and Economics

Other

ACRONYMS, INITIALISMS, ABBREVIATIONS, AND SYMBOLS

ABL	Auke Bay Laboratory
ADF&G	Alaska Department of Fish and Game
AEPS	Arctic Environmental Protection Strategy
AEWC	Arctic Eskimo Whaling Commission
AFTC	Alaska Frozen-Tissue Collection AK - Alaska
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	Alaska National Wildlife Refuge
ASP	Annual Studies Plan (Alaska OCS Region)
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-density [instrument]
DOI	Department of Interior
DPP	Development and Production Plan
EAS	Environmental Assessment Section
ECMRWF	European Center for Medium Range Weather Forecasting
Ed.	Editor
Eds.	Editors
e.g.	for instance
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
ESA	Endangered Species Act

ESP	Environmental Studies Program
EVOS	*Exxon Valdez* 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
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
OMPA	Office of Marine Pollution Assessment
OSRA	Oil-Spill-Risk Analysis
OWM	Oil-Weathering Model
PAAM	Proposed Action and Alternatives Memorandum
PAH	polycyclic aromatic hydrocarbons
PC	personal computer
ppm	parts per million
RFIC	Request for Information and Comments
SPEM	Semi-Spectral Primitive Equation Model
TAG	Technical Assessment Group
TAR	Technology assessment and Research (TAR) Program
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
WOSM	World Oil-Spill Model

Symbols

>	greater than
<	less than

SECTION 1. Programmatic Overview

Introduction

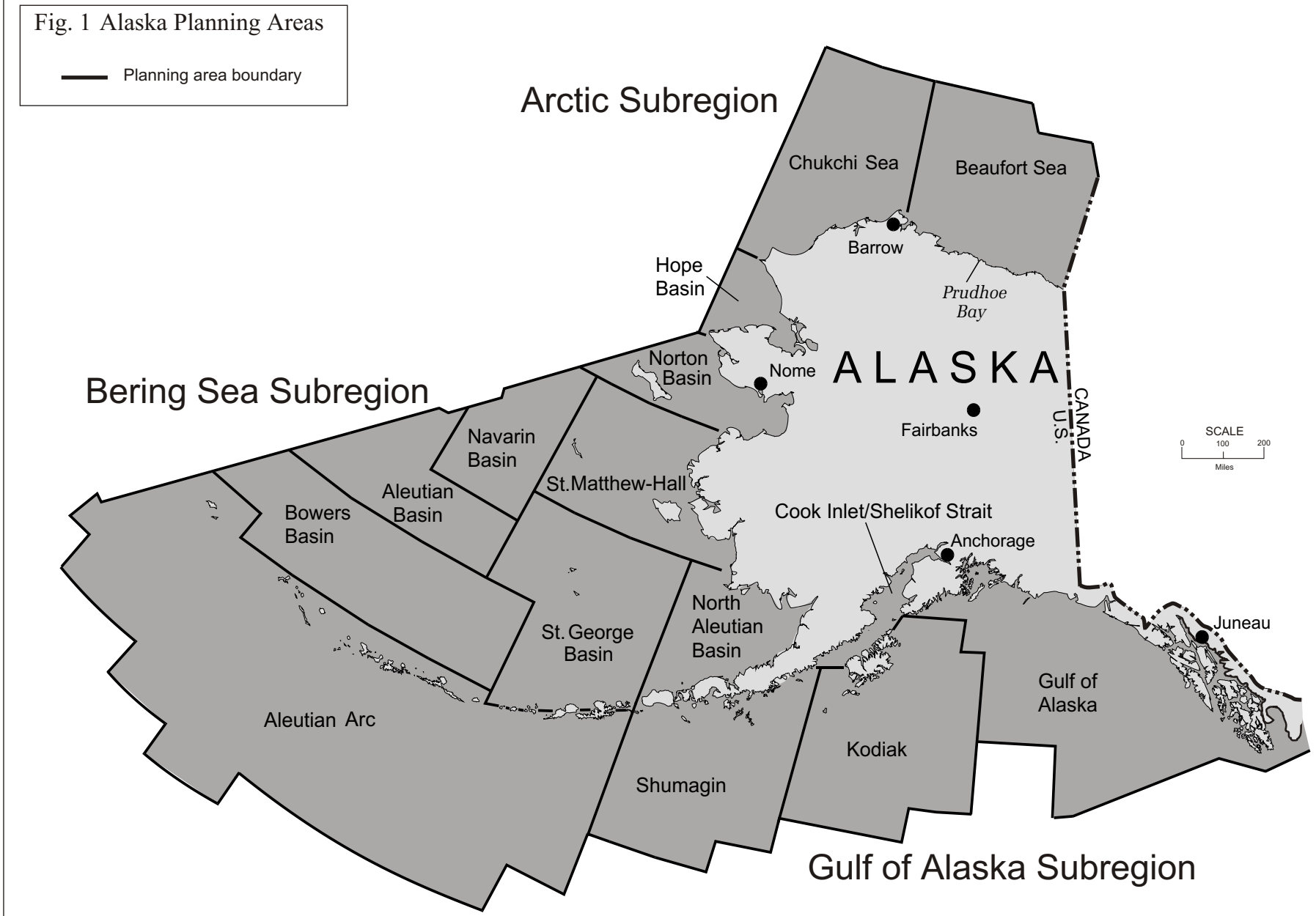
Background

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) 1999, more than $677 million have been spent on the ESP nationally. More than $265 million of this amount has funded Alaskan studies in 15 planning areas in the Arctic, Bering Sea, and Gulf of Alaska Subregions (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



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 resource 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 and socioeconomic information.

The Alaska Annual Studies Plan (ASP) FY 2002-2003 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, proposed lease sales, and existing leases in the Beaufort Sea and Cook Inlet regions.

Current offshore oil- and gas-related issues for which studies are proposed to address in the Beaufort Sea 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?

As the FY 2003 to 2008 Five Year Offshore Oil & Gas Leasing Program is formulated, the Alaska ESP will consider issues identified in scoping and propose appropriate studies.

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. In the same vein that local people expect to be involved in policy decision making, they also desire to participate in project-level decision making related to research activities that seek to understand 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 has been 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 information with MMS scientific activities 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 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 seeks to coordinate plans and ongoing studies with other ongoing programs and research to assure optimal studies management to reduce costs, enhance utilization of existing information, share logistics and equipment, and 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 1998. The MMS anticipates discussing an additional "Framework Issue" with the CMI: the examination of selected species of algae and invertebrates living on OCS oil industry platforms for potential bio-compounds. Genetic and taxonomic investigations combined with screening tests would be used to identify active bio-compounds such as: cancer inhibitors, biochemical enzymes for medical testing and commercial bio-adhesives. 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.

Recently, several other cooperative projects have been initiated including cooperative agreements with:

- Canadian entities to perform a study of tagging and tracking of beluga whales in the Beaufort Sea.
- Alaska Dept. of Fish and Game to jointly perform a multi year monitoring study of ringed seals in the Beaufort Sea.

- Alaska Dept. of Fish and Game to jointly perform a multi year study of social consequences of Alaska OCS Activities.

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 Slope Borough Department of Wildlife Management, National Research Council, Polar Research Board, Cook Inlet Regional Citizens Advisory Council, and industry programs. Additional international linkages with the Russian Academy of Sciences Institutes in Magadan and Vladivostok have also 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.

Projected OCS Activities

Prelease Considerations

This Fiscal Year (FY) 2002-2003 Alaska ASP reflects consideration of the OCS Oil and Gas Leasing Program 1997-2002 for the design and management of the ongoing studies program. 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 assessments.

Beaufort Sale 176 in the Arctic Subregion is the only lease sale on the proposed lease-sale schedule for the period 1997-2002, as updated. Chukchi Sea/Hope Basin Sale 183 in the Chukchi Sea and Hope Basin Planning Areas, Cook Inlet Sale 173 and Sale 179 in the Gulf of Alaska (Yakutat) have been deferred from the 1997-2002 Program. The Bering Sea Subregion has no proposed lease sales. (See Fig.1).

As the FY 2003 to 2008 Five Year Offshore Oil & Gas Program is formulated, the Alaska ESP will identify relevant prelease considerations and propose appropriate studies.

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 development-and-production-phase environmental analyses. Thus, future study plans have become more closely related to development schedules and monitoring and evaluation needs rather than leasing schedules. 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)

To date, there has been no OCS development or production offshore of Alaska. However, exploration, artificial-island construction and abandonment, and unitization agreements (including suspension of leases) have occurred.

In the Beaufort Planning Area, there have been 688 tracts leased in seven OCS Lease Sales. There are currently 82 active leases. (See Fig. 2) Twenty-nine exploratory wells have been drilled and nine 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 Call for Information and Nominations for Beaufort Sea Lease Sale 176 were issued September 1999 and is scheduled to occur in 2002.

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 Corp

of Engineers May 1999 and by MMS September 1999. Construction started in the winter of 2000. The first production is expected in 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 is writing the Environmental Impact Statement for the project. Recoverable reserves are estimated at 120 million barrels of oil. If the proposed project stays on schedule and is approved, construction could start in 2003, with the first oil production in late 2004.

Phillips Alaska Inc. filed a plan for exploration on McCovey in August 2000 for exploration in the winter 2000-2001 (see Fig. 2).

The Sandpiper Unit is located west of Northstar. It is currently under suspension of operation because of uneconomic market conditions.

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. (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).

Available Information

Introduction

This section presents a reference to the extensive body of information currently available relevant to the issues facing the Alaska OCS Region.

The products of the studies are most commonly technical reports, scientific journal articles, data sets, and analytic models. Notice of the availability of these products is widely distributed to potentially interested parties. Anyone interested can contact MMS to have their name put on the mailing list for such notices. The Alaska Region web site, with further information on the Alaska ESP products can be accessed at http://www.mms.gov/omm/alaska/ess/esshome.html. The MMS Environmental Studies Program Information System is also accessible for abstract and document retrievals at http://mmspub.mms.gov/espis.

For all disciplines listed, see a summary of MMS OCS research in USDOI, MMS, Environmental. Policy & Program Division, 1991. A bibliography of scientific journal articles based on MMS environmental research is in USDOI, MMS, Environmental Studies Branch 1993

The Alaska ESP provides a variety of support functions in the areas of information transfer meetings, synthesis, workshops and publication. The ESP supports publication of study results in peer-reviewed literature. Hundreds of papers based on Alaska OCS studies have been published

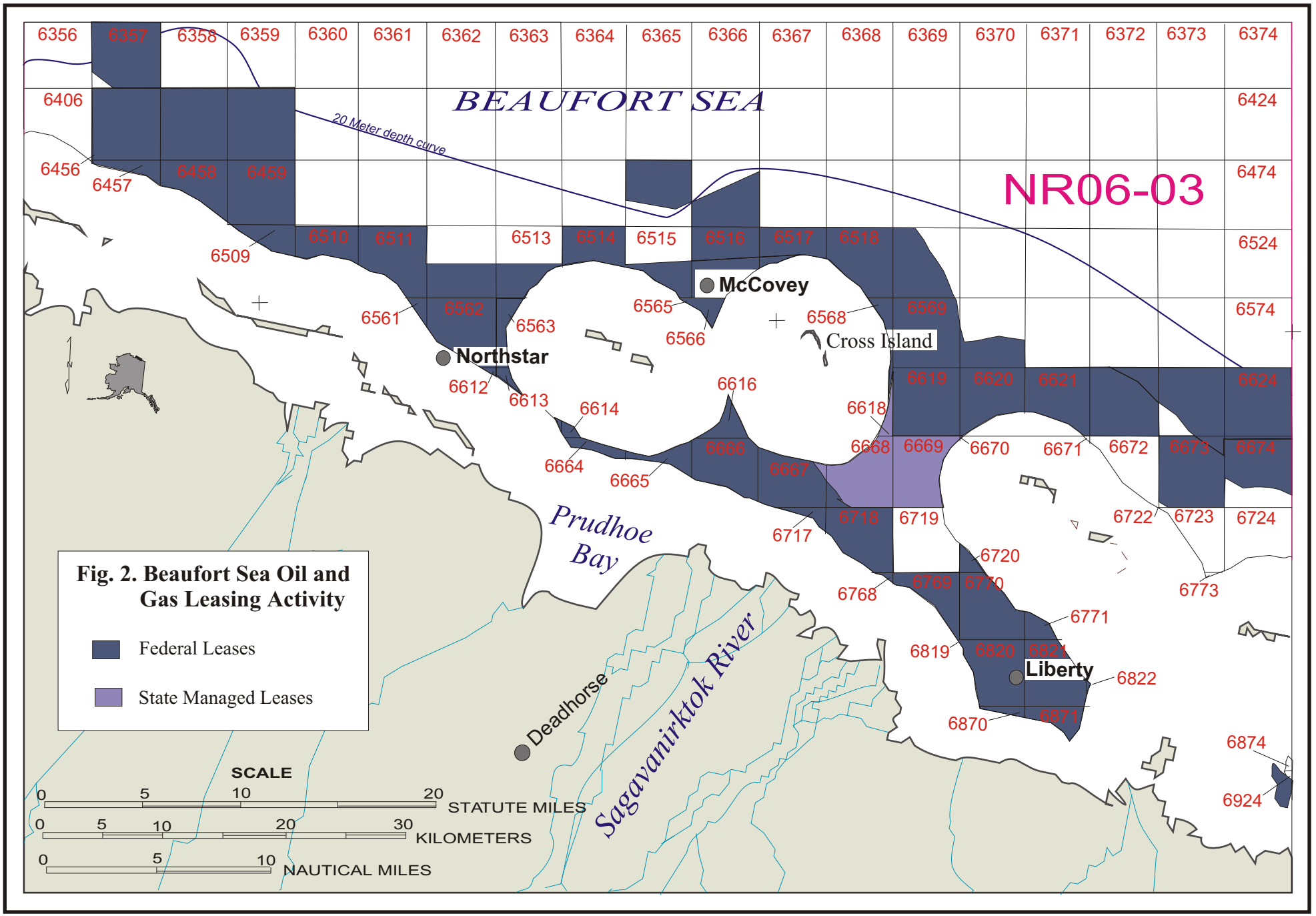
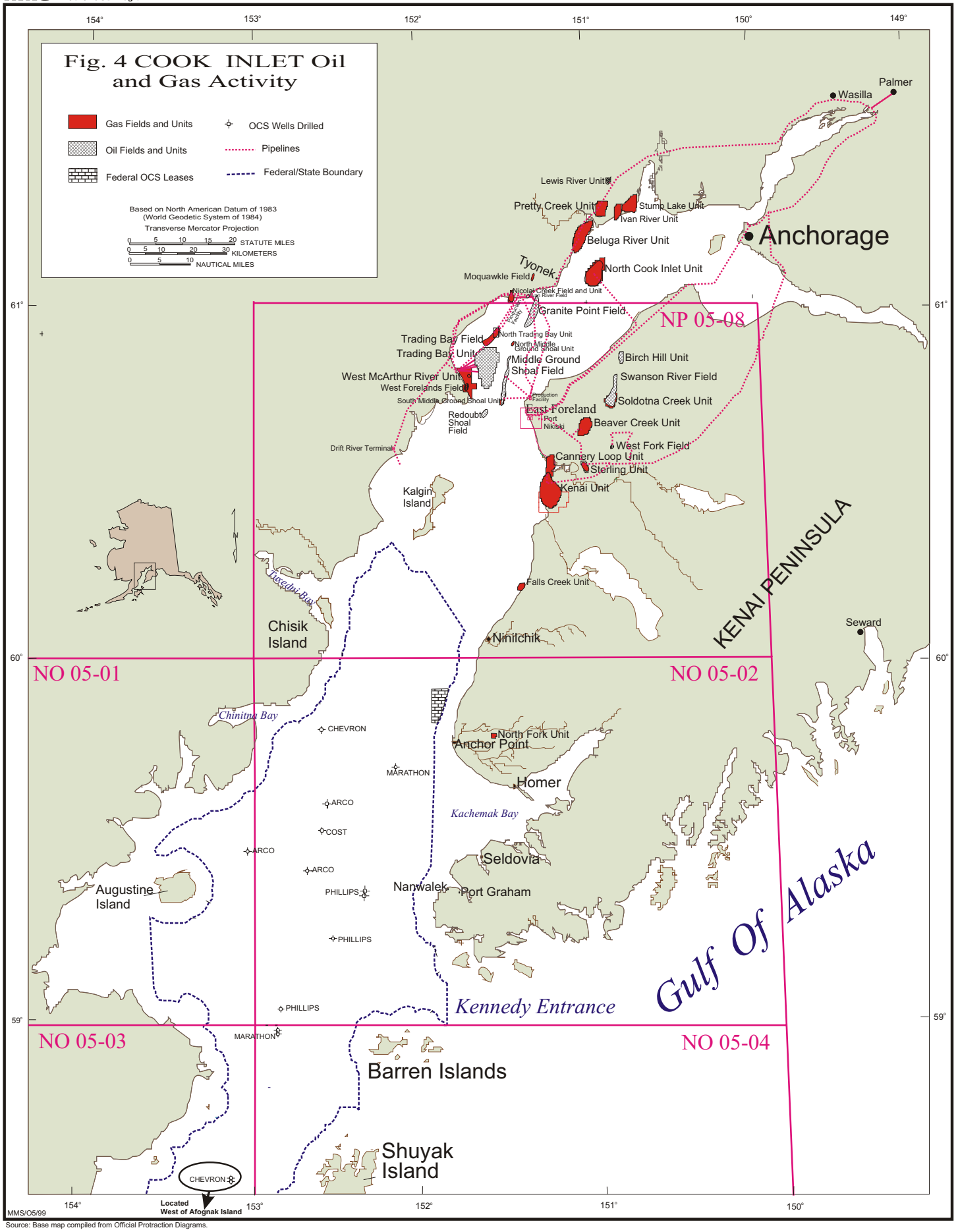

BEAUFORT SEA
20 Meter depth curve
NR06-03
McCovey
Northstar
Cross Island
Prudhoe Bay
Deadhorse
Liberty
Sagavanirktok River
6356 6357 6358 6359 6360 6361 6362 6363 6364 6365 6366 6367 6368 6369 6370 6371 6372 6373 6374
6406 6424
6456 6457 6458 6459 6474
6509 6510 6511 6513 6514 6515 6516 6517 6518 6524
6561 6562 6563 6565 6566 6568 6569 6574
6612 6613 6614 6616 6618 6619 6620 6621 6624
6664 6665 6666 6667 6668 6669 6670 6671 6672 6673 6674
6717 6718 6719 6720 6722 6723 6724
6768 6769 6770 6771 6773
6819 6820 6821 6822
6870 6871
6874
6924
Fig. 2. Beaufort Sea Oil and Gas Leasing Activity
Federal Leases
State Managed Leases
SCALE
0 5 10 20 STATUTE MILES
0 5 10 20 30 KILOMETERS
0 5 10 NAUTICAL MILES

Fig. 3 Module on Northstar Island, August 2000. Crane at left hoisting concrete blocks linked together into a concrete mat. The mat is to be placed on Island slope to protect against wave and ice action.

U.S. Department of the Interior
Minerals Management Service
Alaska OCS Region



Source: Base map compiled from Official Protraction Diagrams.

in scientific journals and books, and several hundred more in published conference proceedings. This improves both the quality of study reports and the distribution and availability of study results to a wide audience.

Physical Oceanography

The Alaska ESP has studied physical oceanography of the Alaska OCS Region as it relates to transport of contaminants and ecological processes. For the Arctic, ocean circulation models have recently been emphasized for the Beaufort Sea (Hedstrom, 1994; Hedstrom, Haidvogel, and Signorini, 1995; USDOI, MMS, Alaska Region, 1999) and Chukchi Sea (Weingartner and Proshtinsky, 1998). Other modeling studies for the Arctic have tested, validated, or provided improved wind products fields to drive Arctic circulation models (UA CMI, 1998; USDOI, MMS, Alaska Region, 1999). One study is using circulation models to evaluate changes in physical processes, such as multi-year reversals of the Beaufort gyre, related to interdecennial shifts in Arctic meteorology (USDOI, MMS, Alaska Region, 1999). Another study has used a physical-biological numerical model to look at the processes involved in the vertical flux of primary production and convection along the Arctic ice edge (UA CMI, 1998; USDOI, MMS, Alaska Region, 1999).

Recent physical oceanographic measurements have been made in both Chukchi and Beaufort Sea Planning Areas, in conjunction with other Federal and international studies (Weingartner, 1998; UA CMI, 1998; USDOI, MMS, Alaska Region, 1999). See also summaries in UA CMI, 1994, 1995, 1996, 1997; Becker, 1987, 1988; Hale, 1987; Norton and Sackinger, 1981; Hameedi and Naidu, 1988; Hurwitz, 1991; NRC, 1993, 1994; Truett, 1984; USDOC, NOAA 1978; USDOI, MMS, Alaska OCS Region, 1998a,b, 1990, 1993, 1996a.

In Cook Inlet, the ESP has mapped rip tides using remote sensing and local knowledge (USDOI, MMS, Alaska Region, 1999); also see summaries in: Hurwitz, 1991; NRC, 1990, 1993, 1994; USDOC, NOAA, 1989; USDOI, MMS, Alaska Region, 1992.

Fate and Effects

The Alaska ESP has emphasized both general and site-specific fate and effects studies. The state of the art in oil spill weathering models has been recently evaluated and the MMS Coastal Zone Oil Spill Model has been improved and updated to a Windows/ArcView environment (Howlett, 1998; Reed et. al., 1998; USDOI, MMS, Alaska OCS Region, 1998). See also summaries in Hale, 1987; Hurwitz, 1991; Norton and Sackinger, 1989: Truett, 1984; USDOC, NOAA, 1989; USDOI, MMS, Alaska OCS Region, 1985, 1998a, 1992, 1993; USDOI, MMS, Offshore Environmental Assessment Division, 1991.

Sediment quality as related to oil and gas contaminants has been recently evaluated at least locally in all Alaska planning areas of current MMS interest. Most recent studies include: evaluation of historical changes in trace metals and hydrocarbons in the Inner Shelf

Sediments, Beaufort Sea, prior and subsequent to petroleum-related industrial development (UA CMI, 1998 and USDOI, MMS, Alaska OCS Region, 1999); current water and sediment quality in Cook Inlet (University of Alaska Anchorage, 1995); and sediment quality in depositional areas of Shelikof Strait and Lower Cook Inlet (Boehm, 1997; USDOI, MMS, Alaska OCS Region, 1999). See also summaries in Becker, 1987, 1988; Geiselman and Mitchell, 1991; Hameedi and Naidu, 1988; Houghton, Segar, and Zeh, 1984; Hurwitz, 1991;Norton and Sackinger, 1989; Truett, 1984; USDOC, NOAA 1978, 1989; USDOI, MMS, Alaska OCS Region, 1998a, 1992, 1996a.

The Alaska ESP has examined in detail the interactions between Alaskan marine sediments and petroleum hydrocarbons in multiple, related laboratory studies (Henrichs, Luoma, and Smith, 1997; Braddock and Richter, 1997; Shaw and Terschak, 1998). See also summaries in UA CMI (1994, 1995, 1996, 1997, 1998) and USDOI, MMS, Alaska OCS Region (1999).

Biology

The Alaska ESP has investigated the life history, food habits, abundance and distribution of fish, seabirds and waterfowl, as well as aspects of their interaction with oil and gas activities. Studies of nearshore-fish populations and their habitats have been conducted in Cook Inlet (e.g. Norcross, et al., 1997; Fechhelm, et al., 1999; Holladay, et al., 1999; also see summaries in: UA CMI, 1994, 1995, 1996, 1997, 1998; USDOC, NOAA, 1989; USDOI, MMS, Alaska OCS Region , 1999) and in the Beaufort Sea (Becker, 1987; Houghton, et al., 1984; Hurwitz, 1991; Norton and Sackinger, 1981; USDOC, NOAA, 1978; also see summaries in ITM Proceedings and MMS, OCS workshops: USDOI, MMS, Alaska OCS Region, 1988, 1990, 1993, 1996a, 1997a, 1998, 1999).

Fish species living in the Beaufort Sea include Arctic char, whitefish, cisco, cod, smelt, flatfish, and sculpin. An extensive Arctic Fisheries Database on these fishes has been compiled from various OCS Environmental Assessment Program (OCSEAP) and MMS studies and placed on a compact disk (Bacon et al., 1993). A catalog of waters important for spawning, rearing or migration of anadromous fishes is in State of Alaska, Department of Fish and Game, 1997. Fisheries enhancement investigations in North Slope oilfields are in Hemming, 1995. Fish surveys of selected Arctic coastal streams is in Hemming, 1996. Additional information on Arctic fishes can be found in Reynolds, 1997.

Major studies of seabirds have been completed, including population studies, reproductive ecology and trophics of marine birds of the Gulf of Alaska/Cook Inlet (Agler, et al., 1994, Slater, et al., 1995; Piatt, 1993; see also discussions in USDOE, MMS 1996a; 1999). Studies of aspects of the life history, food habits, abundance and distribution of seabirds and waterfowl have been conducted in areas of the Beaufort Sea. Various studies are summarized and discussed in a variety of symposium and synthesis documents (e.g., Becker, 1987; Hurwitz, 1991; Johnson and Herter, 1989; Norton and Sackinger, 1981; USDOC, NOAA, 1978, 1989; USDOI, MMS, Alaska OCS Region, 1990, 1993, 1996a, 1997a, 1999).

Major ecosystem studies have been conducted in several areas of the Alaska OCS that are relevant to ongoing or proposed studies. Areas identified as important habitats for major Alaskan species, potential oil- and gas-development sites, and important subsistence-harvest areas have led to studies in the eastern Beaufort Sea (see Fig. 1), Simpson Lagoon, (see Fig. 2), Peard Bay (50 miles southwest of Barrow, see Fig. 1) and, Kasegaluk Lagoon (160 miles southwest of Barrow, see Fig.1).

Information on arctic kelp and the "Boulder Patch" (a unique benthic habitat in Stefansson Sound) are in USDOI, MMS, Alaska OCS Region, 1998.

Protected Species

This category includes all marine mammals, which are protected under the MMPA of 1972, and wildlife species protected under the Endangered Species Act of 1978. Marine mammals in the Beaufort Sea include bowhead, gray, and beluga whales; bearded, ringed, spotted, and ribbon seals; walrus; and polar bear. Recently completed and proposed new MMS OCS studies in the Beaufort focus on bowhead and beluga whales, ringed seal and polar bear.

Since 1979, the Alaska OCS Region has monitored the status of the bowhead whale population through a time series of aerial surveys and behavioral studies. Much of the research on the bowhead whale was summarized and published in the peer-reviewed, hardcopy book *Bowhead Whale Book* (Burns et al. 1993). Updates of the MMS in-house bowhead whale aerial survey project (BWASP) are available in Treacy, 1993, 1994, 1995, 1996, 1997, and 1998. The effects of ambient noise from oil and gas exploration and other potential anthropogenic disturbances on the behavior of bowhead whales have been the subject of study in recent years (e.g. Richardson, et al., 1995; USDOI, MMS, Alaska OCS Region, 1997b). Various studies of the distribution, abundance and behavior of bowhead whales have been presented or summarized in numerous documents: Becker, 1987; Houghton, Segar and Zela, 1984; Hurwitz, 1991; Lentfer, 1988; Richardson, et al., 1995; Marine Mammal Commission, 1990, 1991, 1992, 1993, 1994, 1996; USDOC, NOAA, 1978, 1989; USDOI, MMS, Alaska OCS Region, 1990, 1992, 1996a, 1997b, 1999.

The distribution and abundance of beluga whales in the Beaufort Sea has been the subject of recent investigations (Richard, et al., 1997; Treacy, 1993, 1994, 1995, 1996, 1997, 1998). Richard, et al. (1998) recently completed a study of the movements and dive behavior of beluga whales in the Beaufort using satellite telemetry. The winter distribution of beluga whales in Cook Inlet was recently documented (Hansen and Hubbard, 1999). Other information about and/or studies of beluga whales can be found in (Becker, 1987, 1988; USDOC, NOAA,, 1989; Norton and Sackinger, 1981; Marine Mammal Commission, 1990, 1991, 1992, 1993, 1994, 1996; NRC, 1994; USDOC, NOAA, 1978; USDOI, MMS, Alaska OCS Region 1990, 1993, 1996a, 1999).

The distribution, abundance and behavior of ringed seals in the Beaufort Sea has been the subject of numerous investigations, summaries of which can be found in various reports, syntheses and proceedings: Becker, 1987, 1988; Hale, 1987; Hurwitz, 1991; Norton and Sackinger, 1981; Marine Mammal Commission, 1990, 1991, 1992, 1993, 1994, 1996; NRC, 1994; UA CMI, 1998; USDOC, NOAA, 1978; USDOI, MMS, Alaska OCS Region, 1988, 1996a, 1999.

The individual movements, distribution and abundance of polar bears in the Beaufort Sea have been researched for a number of years but detailed information about individual behavior is mostly limited to adult females because of the inability of researchers to attach radio-transmitter collars to adult male and juvenile bears. Existing information of polar bear distribution, abundance, natural history, behavior and population demographics can be found in: Amstrup and Wiig (1988); Derocher, et al., 1997; Lentfer, 1988; Truett, 1993; Marine Mammal Commission, 1990, 1991, 1992, 1993, 1994, 1996; NRC, 1992, 1994; and various synthesis documents and proceedings (USDOI, MMS, Alaska OCS Region, 1990, 1993, 1996a, 1997a, 1999).

Spectacled eiders occupy Arctic coastal and offshore habitats during spring migration and post-breeding/fall-migration periods, when they move west and south to their as-yet-poorly defined wintering areas, probably in the Bering Sea region. Satellite-tag-monitoring studies are gradually revealing the location of these areas. Steller's eiders also may be found in these areas during migration. Limited information on the distribution, behavior and movements of the endangered spectacled eider and its congenerics can be found in Houghton, Segar and Zeh, 1984, and synthesis and ITM documents (USDOI, MMS, Alaska OCS Region, 1996a, 1997a, 1999).

Social Science and Economics

Subsistence is the predominant sociocultural issue. Several extensive studies have been completed on various aspects of subsistence and different subsistence species in the Arctic Subregion. Traditional knowledge has been incorporated into many specific studies including the study planning, fieldwork, and interpretation of results over the years of the ESP. The Alaska ESP has sponsored more than 160 social and economic studies, many of which directly incorporate traditional and local knowledge as well as information based on survey interviews with local residents. Studies that acquire time-series data designed to correspond to very specific MMS requirements have been conducted. Recent socioeconomic studies are highlighted below.

In recent years there has been an increase in documentation of traditional knowledge on subsistence and subsistence lifestyle in the Alaska arctic. For example, Brower and Napageak (USDOI, MMS, 1997a) documented their perspective on subsistence in a recent symposium. Information from whale hunters on effects of seismic exploration on bowhead whale hunting and whale behavior is also summarized in MMS, USDOI 1997b. North Slope subsistence harvest has also been analyzed in detail in two recent reports (Braund, 1993a, 1993b). The analysis includes amounts of subsistence resource harvest

estimates by species in Barrow and Wainwright in the 1987 to 1989 period. The estimates are based on detailed interviews. Maps of harvest areas are included. These data form important baseline information.

A series of studies between 1988 and 1992 using social indicators as measures of local community and regional well being was completed in 1996. This series provides data that can be used as a baseline to detect and describe future social, cultural and economic changes of Alaskan coastal villages. The villages studied include many on the North Slope and Cook Inlet. Also studied were villages impacted by the *Exxon Valdez* oil spill in 1989 and other coastal villages, which could be used as future study controls. (Human Relation Area Files, Inc. 1992a, 1992b, 1993a. 1993b, 1994a, 1994b, 1994c).

A peer review workshop on social indicators monitoring studies was held in 1996 (USDOI, MMS Alaska OCS Region, 1996b). The intent of the workshop was first to determine how to best use the series of social indicators studies identified above as well as similar earlier studies; and, second, to recommend future directions of social indicators monitoring. Social scientists who conducted the studies, technical reviewers of the studies and other knowledgeable social scientists participated in the workshop.

An investigation of the effects on subsistence uses of fish and wildlife in coastal villages affected by the *Exxon Valdez* oil spill documents observations by Native subsistence hunters and gatherers. Face-to-face interviews on resource harvests and social and community organization were conducted in 1992, 1993, and 1994. The study showed changing perceptions and attitudes about effects of the spill over those three years. The study includes control or reference communities in the Arctic Subregion to strengthen application of findings to broad questions of sociocultural change. (Fall and Utermohle, 1995a, 1995b, 1995c, 1995d, 1995e, 1995f).

The *Exxon Valdez* oil spill itself, the cleanup and the litigation (which now exceeds a decade) have collectively caused a variety of social impacts. A report completed in 1998 analyzes the impacts by selected social factors and provides an annotated bibliography and abstracts of the wide body of literature related to these impacts (Impact Assessment, Inc., 1998).

Reasons for migration of Inupiat of the North Slope and oil industry employment of the Alaska North Slope Natives are analyzed in a report completed in 1993 (Institute for Social and Economic Research, 1993). This report is an important documentation of the low participation rate of Alaska North Slope Natives in the oil industry on the North Slope.

The economic and social affects of the oil industry in Alaska from 1975 to 1995 are documented in a report completed in 1999 (McDowell Group, Inc., 1999).

Commercial fishing data from the early 1980's to the early 1990's and a forecast model which can be updated with current data for the Gulf of Alaska including Cook Inlet is in a

report completed in 1994. The report includes all important commercial harvest species. (Northern Economics, 1994). A variety of other socioeconomic, economic, and sociocultural information is reported and synthesized in documents reporting ITM's and synthesis meetings and workshops: Becker, 1987, 1988; Geiselman and Mitchell, 1991; UA CMI, 1997, 1998; USDOC, NOAA, 1989; USDOI, MMS, Alaska OCS Region 1990, 1992, 1993, 1995**,** 1997a, 1999; USDOI, MMS, Environmental Policy and Programs Division, 1991; USDOI, MMS Environmental Studies Branch, 1993.

Other

Data management and archival into appropriate databases are an integral part of the ESP. As needed for regulation purposes, physical and biological field data may be digitized into standardized formats for submission to the MMS GIS archive Technical Information Management System (TIMS). Once stored, data from multiple projects can be merged for subsequent retrieval by subject or area (e.g., Bacon et al. 1993).

Identification of Information Needs

A letter was distributed to approximately 200 Federal, State, local, environmental, Native, industry, international, and other organizations in May 2000 requesting suggestions for new studies for the FY 2002-2003 ASP. Comments received from respondents were taken into consideration in identifying needed studies. Previous program reviews also were considered. In addition, suggestions for new studies were requested from all components of the Alaska OCS Region staff.

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 January 1999. Approximately 1,000 invitations for the ITM were sent to State and Federal Agencies; borough, city, and village leaders; oil and fishing industry personnel; environmental groups; scientists; contractors; and others. Approximately 200 people, including about 30 MMS personnel, attended various sessions. Also, in March 2000, the Beaufort Sea Information Update Meeting (IUM) was held in Barrow at the request of the North Slope Borough. Over 100 attendees heard 15 presentations. At both the 1999 ITM and the 2000 Beaufort Sea IUM attendees were encouraged by session chairs to comment on the information available, either through oral participation in the question-and-answer periods or afterwards in writing. At the Beaufort Sea IUM, auxiliary meetings were held and ideas were expressed for new study needs.

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.

Some of the studies address recommendations from the NRC in the Alaska ESP. The review is entitled "Environmental Information for Outer Continental Shelf Oil and Gas

Decisions in Alaska" (NRC, 1994). The NRC report was prepared 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 effects 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, 1992*a*), and Volume III on Social and Economic Sciences (NRC, 1992*b*); Volume IV summarizes Lessons and Opportunities (NRC, 1993).

Although the NRC (1994) concluded that the ESP in Alaska is generally extensive, substantive, and of high quality, the lack of data about effects on the human environment was considered a major information need for Alaskan leasing and exploration decisions. The NRC recommended documenting more carefully the changes in the human environment that result from all phases of Federal actions on the OCS.

In addition, the NRC review mentioned the importance of documenting long-term, gradual sociocultural changes from all phases of OCS activities. The NRC also recommended the careful quantification and analysis—and inclusion of scientific conclusions—in social and cultural assessments. Proposed social science studies would further meet this recommendation.

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 Liberty and Northstar as well as long-term effects of any development from OCS Lease Sales 170 and 176. Interagency reviews of related EIS's and Development and Production Plans are expected to lead to additional recommendations for monitoring impacts of Northstar and Liberty. Key constituents have identified the need to monitor under ice currents, sedimentation, underwater noise, and potential effects on social systems/subsistence in the vicinity of Liberty and Northstar developments. Related questions that need addressed are the characteristics of major oceanographic and meteorological processes and how they influence the human, marine and coastal environment.

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 observed that migrating bowhead whales deflect from

their normal migratory route well upstream of active seismic vessels and divert their migration route far offshore. They contend 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. They also are concerned that whales may avoid traditional feeding grounds and are concerned as to the extent to which certain areas are important feeding grounds for migrating bowhead whales. Noise from industrial activity is the central concern.

These concerns are addressed in part by ongoing studies such as the MMS Bowhead Whale Aerial Survey Project (BWASP) and ongoing study titled "Bowhead Whale Feeding in the Eastern Alaskan Beaufort Sea: Update of Scientific and Traditional Information." Also, a study currently under contract titled "Reference Manual and GIS Geospatial Database of Oil Industry and other Human Activity (1979-1998)" is collecting information on past human activities in the Beaufort Sea and will provide this information to proposed future studies. Analysis of this information for covariance of human activities and sea ice in relation to fall migrations of bowhead whales will be needed. 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 effects from petroleum-development activities. Petroleum activities might lead to social disruption and a change in cultural values through population shifts (emigration 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 communications 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 any potential contamination of 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.

Cook Inlet General Information Needs

Physical Oceanography: The MMS Oil Spill Risk Assessment (OSRA) Model needs additional validation in Alaskan waters. A way to verify the OSRA is to deploy satellite-tracked drifters to measure surface currents. A few modest 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: Beluga whales are vulnerable to potential oil spills in Cook Inlet. Noise from vessel traffic associated with oil development activities may temporarily disturb and displace belugas from preferred habitat areas. Additional information is needed to determine areas of Cook Inlet important to beluga whales during winter months to supplement information collected in 1997.

Information Access: Most of the common problems facing the public, researchers, and managers in Cook inlet is the poor understanding of the research needs, and public understanding of what numerous agencies are doing. A multi-agency tracking system of ongoing research in Cook Inlet and its watershed will help MMS focus funding decisions.

Topical Areas for FY 2003

This section presents a general forecast of significant topical issues and concerns to be addressed by proposed studies for FY 2003 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.

Most of the proposed studies in this ASP for FY 2002 will continue into FY 2003 and address the topical areas described below. These will be re-assessed as part of the FY 2003-2004 planning process. However, only a few of the proposed studies will be recommended for initiation in FY 2002.

With offshore oil and gas activity moving into the development phase in the Northstar and Liberty projects 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.

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), are being developed (Northstar) or have been proposed for development (Liberty) and exploration efforts are accelerating. 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 where 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.

Fate and Effects

The Liberty Prospect will be the first oil development to be constructed in OCS waters in Alaska. Construction is currently anticipated to start in winter 2003. The Region is collecting baseline biological and chemical monitoring data in the vicinity of this prospect as part to Arctic Nearshore Impact Monitoring in the Development Area (ANIMIDA). However, the last full field season for ANIMIDA is scheduled for summer 2002, prior to Liberty construction. If Liberty stays on schedule, there will need to be a follow-on monitoring effort to quantify construction and develop effects.

In addition to site-specific monitoring for Liberty, there is a need to re-examine the regional contaminant 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 contaminants be included in Arctic monitoring programs because of their increasing levels. Because of AMAP recommendations and Environmental Justice issues, mercury and persistent organic pollutants should be added to the BSMP analyte list.

Endangered and Protected Species

Expected development activities such as at the Northstar site or forecast for the Liberty site 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.

The spectacled eider is listed as "threatened" under the ESA. Researchers have observed spectacled eider flocks in Beaufort Sea offshore waters during the "open" water period near the Liberty site. Continued research on the spatial distribution and size of eider flocks will be needed in order to prepare more accurate environmental impact assessment and better assure this species' protection. 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.

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 determine the impact of sediment resuspention 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 determine 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.

Marine Fish Migrations, Recruitment and Essential Fish Habitat

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.

Probably of more significance in the near-term has been the issue of the reduced subsistence harvest of Arctic cisco in the Colville River in recent years and the need to have better data regarding recruitment to that population. Nuiqsut villagers are concerned that OCS activities have and will affect cisco populations and 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 is 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.

Biotechnology Potential

The National Ocean Conferences report, "Turning to the Sea: America's Ocean Future" identifies biotechnology as a high priority issue for the nation. MMS recognizes the potential impacts that bio-prospecting and bio-harvesting could have on a region's bio-diversity and conservation of resources. MMS has initiated efforts to assess the taxonomic and genetic bio-diversity on OCS offshore platforms off southern California and the Gulf of Mexico to see if they are representative of the natural ecosystems. MMS also will initiate other preliminary research through its cooperative Coastal Marine Institutes to assess organisms associated with hydrocarbon seeps and offshore sites for biotechnology properties. A FY 2002 biotechnology initiative has been proposed by MMS which would include potential funds for Alaska offshore biotechnology research.

Environmental Data Management

The MMS environmental database for the Alaska OCS Region needs to be enhanced. The database is important for the evaluation and monitoring of new oil- and gas-development projects, analyzing seafloor and biological information in these areas, and more timely completion of environmental analysis required under the National Environmental and Policy Act. The MMS report "Report to the Offshore Environmental Management, Development of a Corporate Environmental Database " (1997) outlines long term data management activities.

Subsistence

Inupiat of the North Slope have repeatedly in recent years expressed concern about cumulative impacts of offshore and onshore developments on their subsistence lifestyle. The Inupiat 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 measures of how the Inupiat society has been 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. Such social indicators should be studied to serve as a basis for determining long-term cumulative impacts.

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 have put forth proposals to build pipelines from Prudhoe Bay to Calgary which would connect with the pipeline system in the Lower 48. They propose to build a pipeline and have production by 2005. 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.

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 alternatives are onshore.) Industry leaders have indicated they want to select a preferred route by then end of 2001. 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.

Literature Cited

Agler, B., Kendall, S. J., Seiser, P.E., Irons, D.E., 1994. *Estimates of Marine Bird and Sea Otter Abundance in Lower Cook Inlet, Alaska During Summer 1993 and Winter 1994*. OCS Study MMS 94-0063.

Amstrup, S., and Oystein, W., eds. 1989. *Proceedings of the Tenth Working Meeting of IUCN/SSC Polar Bear Specialist Group. October 25-29, 1988, Sochi, USSR. Occasional Papers of the IUCN Species Survival Commission (SSC) No. 7*. IUCN/SSC Polar Bear Specialist Group. 107 pp.

Bacon, T., Carns, J., and Shuler, K. 1993. *Arctic Fisheries Database – User's Manual.* OCS Study MMS 93-0057.

Becker, P.R., ed. 1988. *Beaufort Sea (Sale 97) Information Update*. OCS Study, MMS 86-0047. USDOC, NOAA/National Ocean Service, Alaska Office, USDOI, MMS. 81 pp.

Becker, P.R., ed. 1987. *Proceedings of a Synthesis Meeting: The Diapir Field Environment and Possible Consequences of Planned Offshore Oil and Gas Development. Chena Hot Springs, Alaska, 25-28 January 1983*. OCS Study MMS 85-0092. Outer Continental Shelf Environmental Assessment Program, USDOC, NOAA National Ocean Service, Alaska Office. USDOI, MMS. 285 pp.

Boehm, P. 1997. *Sediment Quality in Depositional Areas of Shelikof Strait and Outermost Cook Inlet: Final Literature Synthesis*. OCS Study MMS 97-0015.

Braddock, J., Richter, Z. 1997. *Microbial Degradation of Aromatic Hydrocarbons in Marine Sediments.* OCS Study MMS 97-0041.

Braund, S. R. and Associates. 1993a. *North Slope Subsistence Study – Wainwright 1988-1989*. OCS Study MMS 91-0073.

Braund, S.R. and Associates. 1993b. *North Slope Subsistence Study – Barrow 1987, 1988, 1989*. OCS Study MMS 91-0086.

Burns, J.J., Montague, J.J., and Cowles, C.J., eds. 1993. *The Bowhead Whale*. Special Publication Number 2. The Society for Marine Mammalogy, Lawrence, KS. Series Editor Douglas Wartzok. 787 pp.

Derocher, A., Garner, G. Lunn, N. and Wiig, O., eds. 1998. *Polar Bears: Proceedings of the Twelfth Working Meeting of the IUCN/SSC Polar Bear Specialist Group*. IUCN, Gland, Switzerland and Cambridge, UK. v + 159 pp.

Fall, J., Utermohle, C. 1995a. *An Investigation of the Sociocultural Consequences of Outer Continental Shelf Development in Alaska Volume I. Introduction.* OCS Study MMS 95-0010. Alaska Department of Fish and Game, Division of Subsistence.

Fall, J., Utermohle, C. 1995b. *An Investigation of the Sociocultural Consequences of Outer Continental Shelf Development in Alaska Volume II. Prince William Sound*. OCS Study MMS 95-0011. Alaska Department of Fish and Game, Division of Subsistence.

Fall, J., Utermohle, C. 1995c. *An Investigation of the Sociocultural Consequences of Outer Continental Shelf Development in Alaska Volume III. Lower Cook Inlet*. OCS Study MMS 95-0012. Alaska Department of Fish and Game, Division of Subsistence.

Fall, J., Utermohle, C. 1995d. . *An Investigation of the Sociocultural Consequences of Outer Continental Shelf Development in Alaska Volume IV. Kodiak Island*. OCS Study MMS 95-0013. Alaska Department of Fish and Game, Division of Subsistence.

Fall, J., Utermohle, C. 1995e. . *An Investigation of the Sociocultural Consequences of Outer Continental Shelf Development in Alaska Volume V. Alaska Peninsula and Arctic.* OCS Study MMS 95-0014. Alaska Department of Fish and Game, Division of Subsistence.

Fall, J., Utermohle, C. 1995f. . *An Investigation of the Sociocultural Consequences of Outer Continental Shelf Development in Alaska Volume VI. Summary and Conclusions.* OCS Study MMS 95-0015. Alaska Department of Fish and Game, Division of Subsistence.

Fechhelm, R., Wilson, W., and Griffiths, W. 1999. *Forage Fish Assessment in Cook Inlet Oil and Gas Development Areas, 1997-1998*. MMS 99-0039. Alaska OCS Region, Anchorage, Alaska.

Geiselman, J and Mitchell, K.L., eds. 1991. *Federal Arctic Research Information Workshop. Workshop Proceedings. March 19-21, 1991, Anchorage, Alaska*. OCS Study MMS 91-0053. USDOI, MMS, Alaska OCS Region, Anchorage, AK.

Geraci, J.R. and St. Aubin, D.J., eds. 1990. *Sea Mammals and Oil: Confronting the Risks*. Academic Press, Inc., San Diego, CA 92101. 282 pp.

Hale, D.A., ed. 1987. *Chukchi Sea Information Update*. OCS Study MMS 86-0097. NOAA/National Ocean Service, Alaska Office, USDOI, MMS. 106 pp.

Hameedi, M.J. and Naidu, A.S., eds. 1988. *The Environment and Resources of the Southeastern Chukchi Sea. A Review of Scientific Literature*. OCS Study MMS 87-0113 Special Report USDOC, NOAA/ Alaska Outer Continental Shelf Environmental Assessment Program, UAF, USDOI, MMS, Alaska OCS Region. 103 pp.

Hansen, D., and Hubbard, J. 1999. *Distribution of Cook Inlet Beluga Whales (Delphinapterus Leucas) in Winter*. OCS Study MMS 99-0024.

Hedstrom, K., Haidvogel, D., and Signorini, S. 1995. *Model Simulations of Ocean/Sea-Ice Interaction in the Western Arctic in 1983*. OCS Study MMS 95-0001. 78 pp.

Hedstrom. K. 1994. *Technical Manual for a Coupled Sea-Ice/Ocean Circulation Model (Version 1)*. OCS Study MMS 94-0020.

Hemming, Carl R. 1995. *Fisheries Enhancement Investigations in the Prudhoe Bay and Kuparuk River Oilfields, 1993*. Technical Report 95-3. Alaska Department of Fish and Game, Habitat and Restoration Division.

Hemming, Carl R. 1996. *Fish Surveys of Selected Coastal Streams Sagavanirktok River to Bullen Point, 1995*. Technical Report No. 96-3. Alaska Department of Fish and Game, Habitat and Restoration Division.

Henrichs, S., Luoma, M., Smith, S. 1997. *A Study of the Adsorption of Aromatic Hydrocarbons by Marine Sediments.* OCS Study MMS 97-0002.

Holladay, Norcross & Blanchard. 1999. *A Limited Investigation into the Relationship of Diet to the Habitat Preferences of Juvenile Flathead Sole*. OCS Study MMS 99-0025.

Houghton, J.P., Segar, D.A., and Zeh, J.E. 1984. *Beaufort Sea Monitoring Program: Proceedings of a Workshop (September 1983) and Sampling Design Recommendations.* Outer Continental Shelf Environmental Assessment Program, USDOC, NOAA, USDOI, MMS. 111 pp.

Howlett, E. 1998. *Technical Manual -- COZOIL for Windows (Version 1.1)*. OCS Study MMS 98-0014.

Human Relations Areas Files, Inc. 1992a. *Social Indicators Study of Alaskan Coastal Villages. I. Key Informant Summaries, Volume 1 Schedule A Regions, (North Slope, NANA, Calista, Aleutian-Pribilof)*. OCS Study MMS 92-0031.

Human Relations Areas Files, Inc. 1992b. *Social Indicators Study of Alaskan Coastal Villages. I. Key Informant Summaries, Volume 2 Schedule B Regions. (Bristol Bay, Kodiak, Bering Straits)*. OCS Study MMS 92-0032.

Human Relations Areas Files, Inc. 1993a. *Social Indicators Study of Alaskan Coastal Villages. II. Research Methodology: Design, Sampling, Reliability, And Validity*. OCS Study MMS 93-0035.

Human Relations Areas Files, Inc. 1993b. *Social Indicators Study of Alaskan Coastal Villages. IV. Postspill Key Informant Summaries. Schedule C Communities, Part 1 (Cordova, Tatitlek, Valdez) and Part 2 (Kenai, Tyonek, Seldovia, Kodiak City, Karluk, Old Harbor, Chignik)*.OCS Study MMS 92-0052.

Human Relations Areas Files, Inc. 1994a. *Social Indicators Study of Alaskan Coastal Villages III. Analysis*. OCS Study MMS 93-0070.

Human Relations Areas Files, Inc. 1994b. *Social Indicators Study of Alaskan Coastal Villages. V. Research Methodology for the Exxon Valdez Spill Area, 1988-1992*. OCS Study MMS 93-0071.

Human Relations Areas Files, Inc. 1994c. *Social Indicators Study of Alaskan Coastal Villages. VI. Analysis of the Exxon Valdez Spill Area*. OCS Study MMS 94-0064.

Hurwitz, N. (ed.) 1991. *The Offshore Environmental Studies Program (1973 – 1989). A Summary of Minerals Management Service Research Conducted on the U.S. Outer Continental Shelf*. OCS Report MMS 91-0028. USDOI, MMS, Environmental Policy and Programs Division.

Impact Assessment, Inc. 1998. Exxon Valdez Oil Spill, Cleanup, and Litigation: A Collection of Social-Impacts Information and Analysis. OCS Study MMS 99-0007.

Institute of Social and Economic Research (ISER). 1993. *Migration and Oil Industry Employment of North Slope Alaska Natives.* OCS Study MMS 92-0061.

Johnson, S.R., and Gazey, W.J. 1992. *Design and Testing of a Monitoring Program for Beaufort Sea Waterfowl and Marine Birds.* OCS Study MMS 92-0060. USDOI, MMS, Anchorage, AK.

Kline, T. Jr. and Goering, J. 1998. *University of Alaska Coastal Marine Institute North Slope Amphidromy Assessment. Final Report.* OCS Study MMS 98-0006.

Lentfer, J.W. ed. 1988. *Selected Marine Mammals of Alaska: Species Accounts with Research and Management Recommendations. Final Report.* NTIS PB88-178462. 275 pp.

Marine Mammal Commission. 1990. *Annual Report of the Marine Mammal Commission, Calendar Year 1989. Report to Congress.* NTIS PB90-196361. 239 pp.

Marine Mammal Commission. 1991. *Annual Report of the Marine Mammal Commission, Calendar Year 1990. Report to Congress.* NTIS PB91-164236. 280 pp.

Marine Mammal Commission. 1992. *Annual Report of the Marine Mammal Commission, Calendar Year 1991. Report to Congress.* NTIS PB92-139930. 228 pp.

Marine Mammal Commission. 1993. *Annual Report of the Marine Mammal Commission, Calendar Year 1992. Report to Congress.* NTIS PB95-154530. 241 pp.

Marine Mammal Commission. 1994. *Annual Report of the Marine Mammal Commission, Calendar Year 1994. Report to Congress.* NTIS PB95-173233. 270 pp.

Marine Mammal Commission. 1996. *Annual Report of the Marine Mammal Commission, Calendar Year 1995. Report to Congress.* 235 pp.

McDowell Group, Inc. 1999. *Economic and Social Effects of the Oil Industry in Alaska 1975 to 1995*. OCS Study MMS 99-0041.

Meyer, R.M. and Johnson, T.M. eds. 1990. *Fisheries Oceanography, A Comprehensive Formulation of Technical Objectives for Offshore Application in the Arctic. Workshop Proceedings. April 5-6, 1988, Anchorage, Alaska.* OCS Study MMS 88-0042. USDOI, MMS, Alaska OCS Region, Anchorage, AK.

National Research Council (NRC). 1990. *Assessment of the U.S. Outer Continental Shelf Environmental Studies Program. I. Physical Oceanography*. National Academy Press, Washington, D.C. Physical Oceanography Panel, Committee to Review the Outer Continental Shelf Environmental Studies Program, Board on Environmental Studies and Toxicology, Commission on Geosciences, Environment, and Resources. 143 pp.

National Research Council. 1994. *Environmental Information For Outer Continental Shelf Oil And Gas Decisions In Alaska*. National Academy Press, Washington, D.C. 20418. 254 pp.

Norcross, B., Holladay, B., Dressel S., et al. 1997. *Defining Habitats for Juvenile Groundfishes in Southcentral Alaska with Emphasis on Flatfishes Volume I. Final Report*. OCS Study MMS 97-0046.

Northern Economics. 1994. *Commercial Fishing Industry of the Gulf of Alaska*. OCS Study MMS 94-0048.

Norton, D.W. and Sackinger, W.M., eds. 1981. Proceedings of a Synthesis Meeting: Beaufort Sea – Sale 71 – Synthesis Report. Chena Hot Springs, Alaska, April 21-23, 1981. Outer Continental Shelf Environmental Assessment Program, Juneau, Alaska. USDOC, NOAA, Office of Marine Pollution Assessment, USDOI, BLM. 178 pp.

NRC. 1992. *Assessment of the U.S. Outer Continental Shelf Environmental Studies Program. II. Ecology*. National Academy Press, Washington, D.C. Ecology Panel, Committee to Review the Outer Continental Shelf Environmental Studies Program, Board on Environmental Studies and Toxicology, Commission on Geosciences, Environment, and Resources. 152 pp.

NRC. 1992. *Assessment of the U.S. Outer Continental Shelf Environmental Studies Program. III. Social and Economic Studies.* National Academy Press, Washington, D.C. Socioeconomic Panel, Committee to Review the Outer Continental Shelf Environmental Studies Program, Board on Environmental Studies and Toxicology, Commission on Geosciences, Environment, and Resources.

NRC. 1993. *Assessment of the U.S. Outer Continental Shelf Environmental Studies Program. IV. Lessons and Opportunities.* National Academy Press, Washington, D.C. Committee to Review the Outer Continental Shelf Environmental Studies Program, Board on Environmental Studies and Toxicology, Commission on Geosciences, Environment, and Resources.

Piatt, J. 1993. *Monitoring Seabird Populations in Areas of Oil and Gas Development on the Alaskan Continental Shelf* OCS Study MMS 93-0072.

Reed, M., Johansen, O., Brankvik, Per J., Lewis, A., Fiocco, R., and Mackay, D. 1998. *Revision of MMS Offshore Continental Shelf Oil-Weathering Model: Evaluation*. OCS Study MMS 98-0058.

Reynolds, J., ed. 1997. *Fish Ecology in North America*. American Fisheries Society Symposium 19, 1997. Bethesda, Maryland.

Richard, P., Martin, A. and Orr, J. 1998. *Study of Late Summer and Fall Movements and Dive Behavior of Beaufort Sea Belugas Using Satellite Telemetry: 1997*. OCS Study MMS 98-0016.

Richardson, W.J., Greene, C.R. Jr., Malme, C.I., and Thomson, D.H. 1995. *Marine Mammals and Noise*. Academic Press, Inc., San Diego, CA 92101. USDOI, MMS, Office of Naval Research. 576 pp.

Richardson, W.J., Greene, C. R. Jr., Hanna, J. S., Koski, W.R., Miller, G.W., Patanaude, N.J., and Smultea, M.A. 1995. *Acoustic Effects of Oil Production Activities on Bowhead and White Whales Visible During Spring Migration Near Pt. Barrow, Alaska-1991 and 1994 Phases: Sound Propagation and Whale Responses to Playbacks of Icebreaker Noise*. LGL Report TA954. OCS Study MMS 95-0051

Shaw, D., Terschak, J. 1998. *Interaction Between Marine Humic Matter and Polycyclic Aromatic Hydrocarbons in Lower Cook Inlet and Port Valdez, Alaska*. OCS Study MMS 98-0033.

Slater, L., Byrd, G., Nelson, J., and Ingrum, J. 1995. *Monitoring Populations and Productivity of Seabirds at Colonies in Lower Cook Inlet, Alaska, in 1993 and 1994*. OCS Study MMS 95-0025.

State of Alaska, Department of Fish and Game. 1997. *Catalog of Waters Important for Spawning, Rearing or Migration of Anadromous Fishes* (Arctic Region). Juneau, AK.

Treacy, S. (Project Manager), 1993. *Aerial Surveys of Endangered Whales in the Beaufort Sea, Fall 1992*. OCS Study MMS 93-0023.

Treacy, S. (Project Manager), 1994. *Aerial Surveys of Endangered Whales in the Beaufort Sea, Fall 1993*. OCS Study MMS 94-0032.

Treacy, S. (Project Manager), 1995. *Aerial Surveys of Endangered Whales in the Beaufort Sea, Fall 1994*. OCS Study MMS 95-0033.

Treacy, S. (Project Manager), 1996. *Aerial Surveys of Endangered Whales in the Beaufort Sea, Fall 1995*. OCS Study MMS 96-0006.

Treacy, S. (Project Manager), 1997. *Aerial Surveys of Endangered Whales in the Beaufort Sea, Fall 1996*. OCS Study MMS 97-0016.

Treacy, S. (Project Manager), 1998. *Aerial Surveys of Endangered Whales in the Beaufort Sea, Fall 1997*. OCS Study MMS 98-0059.

Truett, J.C. ed. 1984. *Proceedings of a Synthesis Meeting: The Barrow Arch Environment and Possible Consequences of Planned Offshore Oil and Gas Development. Girdwood, Alaska, 30 October – 1 November, 1983*. USDOC Outer Continental Shelf Environmental Assessment Program, NOAA/Ocean Assessment Division, Alaska Office, USDOI, MMS. 229 pp.

Truett, J.C. ed. 1993. *Guidelines for Oil and Gas Operations in Polar Bear Habitats*. OCS Study MMS 93-0008. MMS, USDOI. 104 pp.

University of Alaska Anchorge, Environment and Natural Resources Institute. 1995. *Current Water Quality in Cook Inlet, Alaska, Study*. OCS Study MMS 95-0009. 124 pp.

University of Alaska Coastal Marine Institute (UA CMI), MMS, University of Alaska Fairbanks (UAF), State of Alaska. 1994. *Annual Report No. 1 – Federal Fiscal Year 1994*. USDOI, MMS, Alaska OCS Region, Anchorage, AK. 16 pp.

UA CMI, MMS, UAF, State of Alaska.. 1995. *Annual Report No. 2 – Federal Fiscal Year 1995*. OCS Study MMS 95-0057. USDOI, MMS, Alaska OCS Region, Anchorage, AK. 122 pp.

UA CMI, MMS, UAF, State of Alaska.. 1996. *Annual Report No. 3 – Federal Fiscal Year 1996*. OCS Study MMS 97-0001. USDOI, MMS, Alaska OCS Region, Anchorage, AK. 191 pp.

UA CMI, MMS, UAF, State of Alaska.. 1997. *Annual Report No. 4 – Federal Fiscal Year 1997*. OCS Study MMS 98-0005. USDOI, MMS, Alaska OCS Region, Anchorage, AK. 81 pp.

UA CMI, MMS, UAF, State of Alaska. 1998. *Annual Report No. 5 – Federal Fiscal Year 1998*. OCS Study MMS 98-0062. USDOI, MMS, Alaska OCS Region, Anchorage, AK. 72 pp.

USDOC, NOAA, Environmental Research Laboratories. 1978. *Environmental Assessment of the Alaskan Continental Shelf. Interim Synthesis: Beaufort/Chukchi*. Prepared under supervision of the Arctic Project Office. 362 pp.

USDOC, NOAA. 1989. *Proceedings of the Gulf of Alaska, Cook Inlet, and North Aleutian Basin Information Update Meeting. February 7-8, 1989. Anchorage, Alaska*. OCS Study, MMS 89-0041,

USDOI, MMS, Alaska OCS Region. 1985. *Proceedings – First Annual Alaska OCS Region Information Transfer Meeting – Bering Sea Region. May 29-31, 1985*. OCS Study MMS 85-0084. Anchorage, AK. 127 pp.

USDOI, MMS, Alaska OCS Region. 1988. *Alaska OCS Region 1987 Arctic Information Transfer Meeting Conference Proceedings. November 17-20, 1987, Anchorage, Alaska*. OCS Study MMS 88-0040. Anchorage, AK. 247 pp.

USDOI, MMS, Alaska OCS Region. 1988. *Sea Ice Forces and Mechanics Conference Proceedings. 22-23 July, 1986, Anchorage, Alaska*. OCS Study MMS 87-0018. 64 pp.

USDOI, MMS, Alaska OCS Region. 1990. *A Synthesis of Environmental Information on Causeways in the Nearshore Beaufort Sea, Alaska. Workshop Proceedings. April 17-20, 1989, Anchorage, Alaska*. OCS Study MMS 89-0038. Anchorage, AK.

USDOI, MMS, Alaska OCS Region. 1990. *Alaska OCS Region Third Information Transfer Meeting Conference Proceedings. January 30 to February 1, 1990, Anchorage, Alaska*. OCS Study MMS 90-0041. Anchorage, AK. 220 pp.

USDOI, MMS, Environmental Policy and Programs Division. 1991. *The Offshore Environmental Studies Program (1973-1989): A Summary of Minerals Management Service Research Conducted on the U.S. Outer Continental Shelf*. OCS Report MMS 91-0028.

USDOI, MMS, Alaska OCS Region. 1992. *Alaska OCS Region Fourth Information Transfer Meeting Conference Proceedings. January 28-30, 1992, Anchorage, Alaska*. OCS Study MMS 92-0046. Anchorage, AK. 303 pp.

USDOI, MMS, Alaska OCS Region. 1993. *Alaska OCS Region Fifth Information Transfer Meeting Conference Proceedings. January 20-22-1993, Anchorage, Alaska*. OCS Study MMS 93-0043. Anchorage, AK. 318 pp.

USDOI, MMS, Environmental Studies Branch. 1993. *Bibliography: Scientific Journal Articles Based on MMS Environmental Research*. OCS Statistical Report. MMS 93-0069.

USDOI, MMS, Alaska OCS Region. 1996a. *Proceedings of the 1995 Arctic Synthesis Meeting. October 23-25, 1995, Anchorage, Alaska*. OCS Study MMS 95-0065. Anchorage, AK. 206 pp.

USDOI, MMS, Alaska OCS Region. 1996b. *Social Indicators Monitoring Study Peer Review Workshop Proceedings, June 18 and 19, 1996, Anchorage, Alaska*. OCS Study MMS 96-0053. 117 pp.

USDOI, MMS Alaska OCS Region. 1997a. *NPR-A Symposium Proceedings: Science, Traditional Knowledge, and the Resources of the Northeast Planning Area of the National Petroleum Reserve-Alaska*. OCS Study MMS 97-0013.

USDOI, MMS, Alaska OCS Region. 1997b. *Arctic Seismic Synthesis And Mitigating Measures Workshop Proceedings. March 5-6, 1997, Barrow, AK.* OCS Study MMS 97-0014.

USDOI, MMS, Alaska OCS Region. 1998. *Arctic Kelp Workshop Proceedings. May 12, 1998, Anchorage, AK*. OCS Study MMS 98-0038. Anchorage, AK.

USDOI, MMS, Alaska OCS Region. 1999. *Seventh Information Transfer Meeting Proceedings, January 19-21, 1999, Anchorage, AK. Focus on the Future – Alaska Environmental Studies.* OCS Study MMS 99-0022. Anchorage, AK.

USDOI, MMS, Offshore Environmental Assessment Division. 1991. *Offshore Oil Spill Movement and Risk Assessment Workshop – Interim Report. November 7-9, 1990, LaJolla, California*. OCS Study MMS 91-0007 Herndon, Virginia.

Weingartner, T. 1998. *University of Alaska Coastal Marine Institute Circulation on the North Central Chukchi Sea Shelf*. OCS Study MMS 98-0026.

Weingartner, T. and Proshutinsky, T., 1998. *University of Alaska Coastal Marine Institute Modeling the Circulation of the Chukchi Sea Shelf*. OCS Study MMS 98-0017.

G:\LE\ESS\sp02\FinalFinal\Parts\Parts$\SECTION 1.doc

SECTION 2. STUDY PROFILES

Alaska Annual Studies Plan FY 2002-2003

Part A. Approved Studies

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):
FY1998 - $623
FY2000 - $20
Total Cost: $643

Period of Performance: FY 1998-2002

Conducting Organization: UAF CMI

Description:

Background Current, temperature, and salinity time series are largely unavailable for the Arctic Ocean, including the 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. Determine the mean transport over the outer continental shelf and slope and the cross-shelf and vertical scales of the mean flow field.

2. Determine the magnitudes of transport variability and the dominant temporal and spatial scales associated with this variability.

3. Determine the relation between variations in temperature and salinity and variations in the flow field at time scales between the synoptic to the seasonal. Determine if changes in the baroclinic flow are consistent with changes in the cross-shelf density structure.

4. Determine the cross-shelf fluxes of heat, salt, and momentum. Determine if these are related to instabilities (eddy generation mechanisms) of the littoral flow.

5. Determine 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 determine 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 the proposed Beaufort Sea Sale in 2002. The data will also be useful in evaluating development plans being submitted for the Beaufort Sea.

Revised Date: January 2001

Region: Alaska

Planning Area: Beaufort Sea

Type: Contract

Title: Evaluation of Sub-Sea Physical Environmental Data for the Beaufort Sea OCS and Incorporation into a Geographic Information System (GIS) Database

Actual Costs (in thousands):
FY1999 - $397
Total Cost: $397

Period of Performance: FY 1999-2001

Conducting Organization: Watson Company

Description:
Background Biological habitats and potential archaeological sites in the Beaufort Sea are directly related to sea-floor morphology, substrate, and sediment cover; water depth; and the severity and cyclicity of dynamic physical processes. Recent exploration and development activities in the Beaufort Sea have highlighted the need for the careful interpretation, and in some cases, reinterpretation of shallow geological and high-resolution geophysical data. This is in the context of evaluating sea floor environmental conditions, biological habitats, potential archaeological sites, and critical pipeline routes for the distribution of oil and gas from OCS development activities. This study will be completed in the year 2001 and will be used in order to evaluate future exploration and development drilling and pipeline plans for the Beaufort Sea.

Objectives The objective of this study is to develop an integrated seafloor characterization and data set for the Beaufort Sea Outer Continental Shelf . All available high-resolution seismic data and shallow subsurface geologic data from various site-specific survey data is to be identified and compiled. The data will be interpreted and quantified in appropriate formats to describe environmental features of the seafloor surface and shallow strata. Analysts will develop analytical tools and manuals for use.

Methods The contractor will interpret all available geophysical survey data, geologic data sets, and data from site-specific survey reports for the Beaufort Sea OCS and from Liberty and Northstar pipeline survey projects, and incorporate the data into a GIS database. Data sets will be created for ice gouging, strudel scour, and other surface and sub-bottom features, including a important marine habitat (i.e., the Boulder Patch) and high profile features of archeological importance. Routines will be established within ArcView/Spatial Analyst that would analyze the database and produce interpretive data and maps. A user's manual will be written that explains the database structure, a data dictionary and describes the

analysis tools to query and analyze the database for the specific purposes defined within the objectives. A reference manual that describes and illustrates interpreted data will be written.

Importance to MMS This unified database will add significantly to the knowledge of ice-sea floor characteristics, interaction and dynamics, critical marine habitat, the identification of potential archeological sites, and serve as a standard for evaluating exploration, production, and transportation of oil and gas in the Beaufort Sea OCS. The database will add significant new information for future EIS's planned for the Beaufort Sea. The data from this study will update the information in the Section that describes the Description of the Environment. The information will be used in the following MMS environmental assessment and decision processes:

1. Provide data for future analysis of the regional potential of prehistoric archaeological resources for implementing 30 CFR 250.126 and provisions of the National Historical Preservation Act.
2. Provide critical habitat information for development projects and the evaluation of exploration plans.
3. Provide ice gouge, strudel scour and other oceanographic information pertinent to oil development activities.
4. Provide other such site-specific and regional data for environmental studies and for writing EIS's and environmental assessments.
5. Assist in evaluation of site and pipeline alternatives EIS's and environmental assessments.

Date Information Required: This information will facilitate preparation of the EIS for the Beaufort Sea Lease Sale 176 in 2001. The deliverables will provide valuable information for future NEPA assessments and exploration or development plan reviews.

Revised Date: January 2001

Region: Alaska

Planning Area: Beaufort Sea

Type: N/A

Title: Synthesis and Collection of Meteorological Data in the Nearshore Beaufort Sea

Actual Cost (in thousands):
FY 2000 - $210
Total Cost: $210

Period of Performance: FY 2000-2002

Conducting Organization: Hoefler Consulting Group

Description:
Background Near future development in the Alaska OCS will be in the nearshore region of the Beaufort Sea. 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). Existing public domain data sets for the Beaufort nearshore are limited and with time series in terms of months, too short to provide sufficient time series for use in MMS models, such as COZOIL, the MMS oil weathering model or the nearshore circulation model proposed within this strategic plan. 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. This study will collect a two-year wind time-series of data from four stations situated just west of Northstar Island and east to the Badami Oil Field. The Badami Oil Field is located south of the proposed Liberty Island Oil and Gas Development Project. In addition, an historical database will be compiled that includes all available digital meteorological wind time-series data between Barrow and the Canadian border.

Objectives

1. Obtain and provide written permission to install, operate, and maintain met stations over the life of the project at specific locations.

2. Deploy and maintain meteorological stations with the collection of data.

3. Collect a historical digital data set.

4. Develop data management system for newly collected wind measurements and historical measurements of wind.

5. Analyze newly collected and historically collated data.

Methods

1. Collect a two-year wind time-series meteorological data from four meteorological stations.

2. Maintain and provide replacement parts for existing stations.

3. Coordinate collection of time series data with Alaska Department of Environmental Conservation efforts in its Air Quality and Industry Preparedness and Pipeline Programs.

4. Synthesize existing historical wind time-series data along with newly collected meteorological data.

5. Create a final report that analyzes all of the existing meteorological data for the North Slope and Beaufort Sea nearshore environment.

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 studies such as "Arctic Nearshore Impact Monitoring in Development Area (ANIMIDA)." The database will be provided to BES/TAG to use in validating the MMS Arctic Regional Circulation Model and Oil Spill Trajectory Analysis.

Date Information Required: This study will start in FY 2000 to support enhancement of circulation models and review of future oil-spill contingency plans. The information will also be used to support future lease sales in the Beaufort Sea.

Revised Date: January 2001.

Region: Alaska

Planning Area: Beaufort Sea

Type: Cooperative Agreements with CMI and UAF

Title: Beaufort Sea Nearshore Under-Ice Currents: Science, Analysis, and Logistics

Actual Costs (in thousands):
FY 1999 - $145
FY 2000 - $ 89
FY 2001 - $130
Total Cost: $364

Period of Performance: FY 1999-2002

Conducting Organization: UAF CMI (FY 1999) and UAF (FY 2000-2001)

Description:
Background Understanding the under-ice currents is a necessary precursor to estimating potential effects on sensitive resources from oil spills or in the landfast ice zone, and in particularly at the Liberty and Northstar projects. The one study of under-ice currents by MMS (in 1978) indicated that under-ice oil spills can move and pose risk to off-site, and in particular, shoreward resources. The 1978 study found that average currents under landfast ice appeared to be related to brine drainage and peak currents to negative surges, with neither related to the regional circulation pattern. The study was unable to measure currents directly under the ice, but instead calculated them from mass-balance considerations to average of 6 centimeters per second (cm/s) and to peak up to 37 cm/s towards the coast. Depending on the shallowness of the unmeasured pycnocline, these currents may have been faster. Under-ice current speed and direction are important because currents of 10-20 cm/s will move spilled oil along the underside of the ice.

The current, 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. This project provides critical information to MMS ANIMIDA program and should be continued in FY 2001 to support ANIMIDA Phase II.

Objectives

1. Measure currents, temperature, and salinity hourly at three locations in the landfast ice zone in the vicinities of Northstar and Liberty prospects.

2. Quantify the magnitude of current variability and to describe the relationship between currents and local winds.

3. Determine 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 ANIMIDA study.

Methods

1. A1200 kHz acoustic Doppler current profilers (ADCPs) will be moored at three sites near Liberty and Northstar prospects for one year. The mooring closest to Liberty included a SeaCat with transmissometer in 1999-2000 and 2000-2001. All three moorings will have transmissometers in 2001-2002.

2. Local winds measured at Deadhorse and sea level data collected at the Waterflood facility will be collated for time-series comparison with mooring data.

3. 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 in evaluating possible cumulative effects from two decades of oil production and industry development along the Beaufort Sea coast. The data from the study will be comparable to the earlier MMS pre-development studies.

Date Information Required: The information is currently be used by the MMS ANIMIDA study. This information will be used to evaluate oil spill contingency plans. It would also be used for NEPA assessments, such as the Oil and Gas Leasing Program 2003-2008 EIS, post-lease environmental assessment of Beaufort Lease Sale 176, and probable lease sales in the 2003-2008 Leasing Program.

Revised Date: October 2000

Region: Alaska

Planning Areas: Beaufort and Chukchi Seas and Hope Basin

Type: Cooperative Agreement with CMI

Title: Beaufort Sea and Chukchi Sea Seasonal Variability for Two Arctic Climate States

Actual Costs (in thousands):
FY 1999 - $282
Total Cost: $282

Period of Performance: FY 1999-2002

Conducting Organization: UAF CMI

Description:
Background Proshutinsky and Johnson (1997) recently showed evidence for the existence of two regimes or climate states for arctic atmosphere-ice-ocean circulation. Wind-driven motion in the Arctic was found to alternate between anticyclonic and cyclonic circulation with each regime persisting for 5-7 years, based on analysis of modeled sea level and ice motion. Anticyclonic wind-driven motion in the Arctic and Beaufort Sea appeared during 1946-1952, 1958-1962, 1972-1979, and 1984-1988. Cyclonic motion appeared during 1953-1957, 1963-1971, 1980-1983, and 1989-1997. The two climate states should differ in ice cover, ice thickness and drift, circulation (including reversal of the Beaufort gyre), ocean temperature and salinity, heat fluxes, wind speed, atmospheric pressure, cloudiness, and precipitation and runoff. Confirmation of significant climate state differences has strong implications for both circulation and oil spill modeling in the Arctic. MMS would need to take climate state differences into account to avoid unintentional bias and error in stochastic modeling of water, ice, or oil movement.

Objectives

1. Compare temporal and spatial variability of environmental fields at seasonal and inter-annual time scales.

2. Compare circulation and ice drift data for the two climate states.

3. Compare differences between ice cover for the two climate states.

4. Compare differences in 3D temperature and salinity distributions for the two climate states.

Methods

1. Analyze temporal and spatial variability of environmental fields using standard oceanographic statistical analyses, time series analyses, and empirical orthogonal function analysis.

2. Use hierarchy of modeling studies using a 3Dcirculation model to compare ice drift and ocean circulation under the two regimes.

3. Assign historical SMMR and SSM/I data collected since the late 1970's and the Walsh Johnson data set (digitized ice charts for the period 1905-1995) to the two climate states and compare to calculate the differences in ice concentration/cover for the two states.

4. Use the 3D model to compare temperature and salinity distributions for the two climate states on the basis of model results and observational data collected during the two climate states.

5. Provide analysis for each climate state of:
    a. Remotely sensed ice motion fields.
    b. Simulated surface circulation, wind forcing, ice motion, and ice cover fields.

Importance to MMS This study is precursor in evaluating whether MMS needs to change how we model Arctic circulation and oil spill trajectories. If this study confirms the importance of climate states in the Arctic, then using data averaged across both climate states to drive the circulation models may give erroneous results.

Date Information Required: This would be used for the Oil and Gas Leasing Program 2003-2008 EIS, post-lease environmental assessment of Beaufort Lease Sale 176, and probable lease sales in the 2003-2008 Leasing Program.

Revised Date: January 2001

Region: Alaska

Planning Area: Beaufort, Chukchi, Bering and Cook Inlet

Type: Cooperative Agreement CMI

Title: Alaska Sea Ice Atlas

Actual Costs (in thousands):
FY 2000- $195
Total Cost: $195

Period of Performance: FY 2000-2002

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, graphs to cover: fast ice stability and ice movements (late May to early July); summer nearshore ice invasions (July 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 potential exploration and development plans after FY 2004.

Revised Date: January 2001

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 1999-2001
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. Train MMS users.

3. Modify/improve the new OWM to meet MMS needs in environmental assessment and contingency plan review.

4. Add oils of concern to MMS to the OWM oil library.

5. Promote development of an experimental oil spill database that allows validation of model algorithms in various models against real data.

6. Provide Windows 95/NT, PC-based OWM code, any necessary software to run the model, users' manual, 1-day workshop to demonstrate model and 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: Information from this study will be used by the MMS, Alaska OCS Region, staff in preparing all future EIS's and in reviewing oil-spill-contingency plans for OCS and coastal facilities.

Revised Date: January 2001

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):
FY 2000 - $407
Total Cost $407

Period of Performance: FY 2000-2003

Conducting Organization: UAF CMI

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 Ice-ocean circulation 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 Arctic exploration and development EIS's and in reviewing oil-spill-contingency plans for OCS and coastal facilities.

Revised Date: January 2001

Region: Alaska

Planning Area: Beaufort Sea

Type: Competitive (FY 2000)/Joint Funding (FY 2002)

Title: Environmental Sensitivity Index Shoreline Classification in the Arctic

Actual Costs (in thousands):
FY 2000 - $154
FY 2002 - $36 to $54
Total Costs: $190 to $208

Period of Performance: FY 2000-2003

Conducting Organization: Research Planning, Inc.

Description:
Background Industry and State and Federal Agencies including MMS form the Alaska North Slope Task Force. Of this group Industry, NOAA and the USCG are funding the compilation of Industry's Environmental Sensitivity Index (ESI) shoreline classification and biological data from the Colville to the Canning River. The majority of the Beaufort Sea coastline was classified for sensitivity to oil spills 20 years ago. These ESI shoreline data are out of date and need to be remapped for the data to be useable.

The ESI shoreline classification contains water and land features, rivers and streams, source codes, and Environmental Sensitivity Index classification for shoreline. These data are needed for use in the MMS Corporate Environmental Database and for computer analysis using ArcView. The Coastal and Offshore Resource Information System (CORIS) is designed to provide an authoritative database for environmental analysis in MMS. With the use of peripheral programs, analysts will be able to quickly identify resources at risk and run analytical routines to determine potential impacts. Currently the oil industry has mapped ESI type from the Colville to the Canning River. NOAA has published maps which are partially based upon these data and show the mapping of "Sensitive Shoreline Habitats" between the Colville and the Canning Rivers. The ESI shoreline classification data are not in the CORIS format. Data on ESI shoreline type for the Beaufort Sea from Barrow to the Colville River and from the Canning River to the Canadian Border are more than 20 years old and are very generalized. They are not compatible with the accuracy of the CORIS data structure and are not in a digital format.

In FY 2002 a Coastal America Partnership Project is expected to seek funding for a jointly-funded project to complete environmental sensitivity mapping for the Chukchi Sea coast. Potential partners include NOAA, the Oil Spill Recovery Institute, and MMS. Estimated funding requirement for MMS represents approximately 50 percent estimated funds needed.

Objectives The primary objective of this study is to obtain an updated ESI shoreline data set for use in ArcView/Arc Info. The ESI shoreline data set will also be used in analysis of oil spill prevention plans and to facilitate faster and more accurate environmental analysis in the Beaufort Sea environmental impact statements and environmental assessments.

Methods

1. Use existing Industry ESI shoreline data from the Colville to Flaxman Island and convert them into a data structure that builds on the Coastal and Offshore Resource Information System (CORIS) data structure.
2. Identify any additional data completed by Industry by the start of this study and convert them into a data structure that builds on the CORIS data structure model.
3. Map the Beaufort Sea coastline ESI shoreline type from Barrow to the Colville and the Canning to the Canadian Border using aerial overflights and videography.
4. Select the appropriate number of sites for ground-truthing remotely collected ESI shoreline type data.
5. Establish ESI shoreline type data set using video and ground truth data. This data set is for Beaufort Sea shoreline from Barrow to the Colville River and from the Canning River to the Canadian border consistent with CORIS data structure and the resolution of the ESI data from the Colville to the Canning Rivers.
6. Create a data set containing:
   a. Water and land polygons
   b. Type of linear feature
   c. Source Code
   d. ESI Classification
7. Participate in potential Coastal America Partnership for possible extension of this study to cover portions of the Chukchi Sea coast in FY 2002-2003.

Importance to MMS The ESI shoreline classification is an important part of the MMS environmental assessment of potential impacts from spilled oil. This study will improve MMS's ability to assess potential shoreline effects by providing direct information to analysts, improving the selection of environmental resource areas for the oil spill risk analysis model and improving the information base in the COZOIL model. This study will update the existing classification of shoreline in the Beaufort Sea and make the data available in a digital format. This information will be available in Technical Information Management System mapping for MMS decision-makers, Environmental Impact Statement analysts and others who need the information for regulatory function. Potential extension of this study into Chukchi Sea shorelines is applicable to future OCS information needs in the possible event of further industry interest in the Chukchi Sea.

Date Information Required: The initial Beaufort Sea part of this study should be done in FY 2001 for review of oil-spill contingency plans for developments in the Beaufort Sea and preparation of EIS's for possible future Beaufort Sea Lease Sales. The Chukchi part should be done in FY 2002 or FY 2003 for EIS's for a possible future Chukchi Sea Lease Sale.

Revised Date: January 2001

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):
FY 1999 - $59
Total Cost: $59

Period of Performance: FY 2000-2002

Conducting Organization: UAF CMI

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 that 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 us of information from both planning areas in environmental assessments.

Date Information Required: The information will be used in preparation of the Beaufort Sea Sale 176 EIS in 2002 and any environmental assessments for existing Beaufort Sea and Cook Inlet leases.

Revised Date: January 2001

Region: Alaska

Planning Area: Beaufort Sea

Type: Cooperative Agreement with CMI

Title: Petroleum Hydrocarbon Degrading Communities in Beaufort Sea Sediments

Actual Costs (in thousands):
FY 1999 - $50
FY 2000 - $31
FY 2001 - $67
Total Cost: $148

Period of Performance: FY 1999-2002

Conducting Organization: UAF CMI

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 will be determined 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 the Oil and Gas Leasing Program 2003-2008 EIS, post-lease environmental assessment of Beaufort Lease Sale 176, and probable lease sales in the Oil and Gas Leasing Program 2003-2008.

Revised Date: January 2001

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):
FY1999 - $ 20
Total Cost: $ 20

Period of Performance: FY 1999-2001

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

Description:

<u>*Background*</u> 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.

<u>*Objectives*</u> The objectives of this study are to determine the role of copepods in the distribution and bioremediation of hydrocarbons in the environment. Specifically, this study will:

1. Determine the composition and seasonal variation of lipids in forage plankton in Prince William Sound.

2. Determine the relationships between lipid content and lipid composition in forage plankton and patterns of accumulation of hydrocarbons in copepod body tissue.

3. Determine the role of the copepods *Neocalanus* spp. and *Pseudocalanus* spp. in the distribution of mineral hydrocarbons in the environment.

<u>*Methods*</u> 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 about processes at the level of primary consumers 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 pre- and post-lease information needs for Cook Inlet and Gulf of Alaska lease sales.

Revised Date: January 2001

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):
FY 1999 - $71
Total Cost: $71

Period of Performance: FY 1999-2002

Conducting Organization: UAF CMI

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 are vulnerable to both natural and anthropogenic changes (e.g., Outer Continental Shelf 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 are excellent environmental indicators, and can be thought of as small biological filters sampling various aspects of marine ecosystems. Thus, they 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, 2mL 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 industrial contamination. This will permit enhanced postlease monitoring in the Beaufort Sea and Cook Inlet. This project is needed to support environmental assessment and exploration monitoring for past, ongoing, and upcoming offshore operations in Alaska planning areas. Data products and annual reports will provide critical and timely inputs to the environmental assessment process. The study also will develop information useful to enhancement of outreach efforts with local constituencies.

Date Information Required: FY 2002

Revised Date: January 2001

Region: Alaska

Planning Areas: Beaufort Sea

Type: USGS Biological Resources Division

Title: Modeling Recovery Rates for Avian Populations

Estimated Costs (in thousands):
FY 2001 - $125 (BRD)
FY 2002 - $125 (BRD)
Total Cost: $250 (BRD)

Period of Performance: FY 2001-2002

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. Because concern over the nature of previous analyses has been expressed by the U. S. Fish and Wildlife Service (FWS) in recent document review comments, 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, that 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 seaducks, 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: Preliminary information required early in FY 2001 for the Liberty project, early to mid-FY 2001 for Beaufort Sea Sale 176 EIS.

Revised Date: January 2001

Region: Alaska

Planning Areas: All Alaska Planning Areas

Type: USGS Biological Resources Division

Title: Alaskan Marine Mammal Tissues Archival Project

Actual Costs (in thousands):
FY1999 - $ 88 (BRD)
FY2000 - $ 88 (BRD)
FY2001 - $ 88 (BRD)
FY2002 - $ 88 (BRD)
FY2003 - $ 88 (BRD)
Total Cost: $444 (BRD)

Period of Performance: FY 1999-2003

Conducting Organization: USGS Biological Resources Division

Description:
Background Alaskan Natives use many marine mammal species for subsistence and thus are concerned about possible contamination from OCS-related discharges. Also, chemical pollution might adversely affect disease resistance in marine mammals. The collection of marine mammal tissues over a period of years allows for determination of baseline contaminant loads for comparisons with 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 AEPS/AMAP. Tissues collected so far 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 so far 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. Determine and monitor levels of heavy metals, PAH's, and other contaminants associated with the oil and gas industry in marine mammals, with special emphasis on subsistence resources.

3. Monitor the condition of archived samples over time.

4. Develop new parameters and indices (e.g., biomarkers) to describe contaminant burdens.

5. Relate contaminant burdens to human-health-risk assessment.

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.

Upcoming analyses will focus on methods for detecting current or recent contact with petroleum through (1) improved PAH testing, (2) increased collection of metabolite biomarkers in liver bile, and (3) comparisons with potentially associated levels of vanadium. Specimen inventories will be provided for archiving.

Importance to MMS Information from periodic analyses of aliquots from this tissue bank are increasingly used by Alaska Native groups to identify contaminants in their subsistence diet. The study provides additional baseline data in areas of interest to the gas and oil industry. Tissues collected in the Beaufort Sea will continue to help monitor postlease contaminant levels in subsistence-hunted species pursuant to offshore drilling operations for Lease Sales 71, 124, 144, 170, and 176. Continuity of funding for this study is considered critical to maintain previously collected tissues in cryonic storage.

Date Information Required: This continuation study is needed to support environmental assessment and exploration monitoring for past, ongoing, and upcoming offshore operations in Alaska planning areas. Data products and annual reports will provide critical and timely inputs to the environmental assessment process. The study will also develop information that addresses public concerns raised during outreach efforts.

Revised Date: January 2001

Region: Alaska

Planning Areas: All Alaska Planning Areas

Type: Cooperative Agreement with CMI

Title: The Alaskan Frozen-Tissue Collection and Associated Electronic Database: A Resource for Marine Biotechnology

Actual Costs (in thousands):
FY1998 - $75
Total Cost: $75

Period of Performance: FY 1999-2001

Conducting Organization: UAF CMI

Description:
Background The Alaska Frozen Tissue Collection (AFTC) collects animal tissues from a variety of species, thus addressing concerns of Alaskan Native subsistence hunters over possible contamination of food from various industrial sources. The AFTC has been collecting animal tissues for years, but it has been difficult to access the information on tissue analyses. The tissue inventory is fully computerized and, where available, shows latitudes and longitudes of collected specimens for potential GIS mapping.

Objectives

1. Increase the existing collection of tissues from marine mammals and other specimens of the Beaufort Sea, Cook Inlet, Shelikof Strait, and other planning areas.

2. Develop an electronic database that is accessible through the Internet, thus facilitating the transfer of information and sharing genetic resources among tissue investigators.

3. Ensure a long-term systematic record of frozen tissues from Alaska's marine ecosystems.

Methods Tissues and specimen data are collected by participating scientists from marine mammals, birds, fishes, and invertebrates. The AFTC coordinates with the ongoing MMS/BRD Alaska Marine Mammal Tissue Archival Project (AMMTAP), to collect additional marine mammal tissues from fresh carcasses using AMMTAP's cryogenic tissue-collection protocols.

Importance to MMS Tissues are made available for contaminant and other types of analyses such as determination of the genetic status of harbor seals and other species. The study is developing an electronic database that is accessible through the Internet, thus facilitating the transfer of information

among interested investigators. The sample size of marine mammals sampled for AMMTAP will be enlarged and more tissues from marine mammals, birds, fishes, and invertebrates from the Beaufort Sea will be available for analyses of industrial contaminants of interest to oil and gas development. This will permit enhanced postlease monitoring and discrete stock identifications pursuant to Lease Sales 71, 124, 144 and 170 in the Beaufort Sea and Cook Inlet.

Date Information Required: This continuation study is needed to support environmental assessment and monitoring for ongoing and upcoming offshore operations in the Beaufort Sea. Data products and annual reports will provide critical and timely inputs to the environmental assessment process. The study also will develop information useful to enhancement of outreach efforts with local constituencies.

Revised Date: January 2001

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN 2002-2003

Region: Alaska

Planning Area: Beaufort Sea

Type: USGS, Biological Resources Division

Title: Monitoring Beaufort Sea Waterfowl and Marine Birds

Actual Cost (in thousands):

	MMS	BRD
FY1999 -	$164	$100
FY2000 -	-0-	$300
FY2001 -	-0-	$300
FY2002 -	-0-	$300
Total Cost:	$164	$1,000

Period of Performance: FY 1999-2003

Conducting Organization: USGS Biological Resources Division

Description:

Background Oldsquaw, eiders, and other waterbirds feed, molt, stage and/or migrate in various Beaufort Sea marine habitats. Recent data show that threatened spectacled eiders, as well as other species of concern, stage in nearshore and offshore Beaufort Sea waters. An existing protocol, entitled "Design and Testing of a Monitoring Program for Beaufort Sea Waterfowl and Marine Birds" (OCS Study MMS 92-0060), was developed and tested in the Beaufort Sea area that includes the Northstar, Sandpiper, and Liberty Units. This study covers the areas and species most likely to be affected by activities associated with oil and gas development in these units.

Objectives The overall goal of this study is to monitor the effects of potentially disturbing activities associated with oil and gas development on the distribution and abundance of waterfowl and other waterbirds using marine habitats in the east-central Beaufort Sea. Specific objectives are to:

1. Develop a monitoring protocol to determine distribution and abundance of common eiders breeding on barrier islands.

2. Investigate potential effects of disturbance on oldsquaw and common eider annual cycle parameters that could cause changes in their distribution and abundance.

3. Compare the results with historical data to detect trends; coordinate with ongoing studies and incorporate pertinent interpretation of their findings into the final report.

4. Recommend cost-effective and feasible options for future monitoring.

Methods Waterfowl and marine bird populations will be monitored in the vicinity of ongoing and proposed oil industry activities in the east-central Beaufort Sea through three open-water seasons using an existing protocol that involves replicate aerial surveys of established transects and other areas indicated above. Specifically,

1. Use an existing protocol (Johnson and Gazey, 1992) to monitor numbers of oldsquaw and other species in *industrial* and *control* areas defined by these investigators.
   a. Perform replicate aerial surveys along previously established transects in a manner that will allow comparison with the earlier results.
   b. Expand the survey to include nearshore areas between the original *industrial* (Jones-Return Islands) and *control* (Stockton-Maguire-Flaxman Islands) areas.
   c. Define the range of variation for area waterfowl and marine bird populations, and correlate with environmental factors and oil and gas development activities.

2. Expand aerial monitoring about 50 km offshore to determine the extent of use of this habitat by eiders, in particular, where they would be vulnerable to oil spills originating in the Northstar and Liberty Units; determine if the use of specific areas is predictable.

Importance to MMS Data on waterfowl distribution and abundance from this study will be used in USFWS and MMS efforts to model the effect of various oil spill scenarios on Beaufort Sea waterfowl populations. A monitoring protocol will be developed that can be used to study the effects of offshore developments. Information from this study also will provide the basis for mitigation measures.

Date Information Required: Study information will be used for environmental assessment related to the Liberty EIS, Beaufort Sea Sale 176 EIS and Northstar and Liberty monitoring.

Revised Date: January 2001

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):
FY1999 - $ 325
FY2000 - $ 310
FY2001 - $ 350
FY2002 - $ 350
FY2003 - $ 350
Total Cost: $1,685

Period of Performance: FY 1999 -2003

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.

Objectives The primary goals of the project are to:

1. 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.

2. Monitor temporal and spatial trends in the distribution, relative abundance, habitat, and behaviors (e.g., feeding) of endangered whales in arctic waters.

3. Provide annual analyses of long-term, inter-year trends in the distance from shore and water depth of migrating bowhead whales.

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 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 in-house study is needed for decisions on environmental assessment and exploration monitoring for past and upcoming offshore operations in the Beaufort Sea (from Lease Sales BF, 71, 124, 144, 170, and 176). It does this by providing long-term information on the potential for area-wide and cumulative effects of oil and gas activity on the fall migration of bowhead whales. The MMS Regional Supervisor, Field Operations, needs this information to ensure that industry activities do not pose a "threat of serious, irreparable, or immediate harm to the species". The BWASP also 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 seasonal drilling and geological and/or geophysical exploration. The bowhead whale is protected under the Endangered Species Act and is of great importance to Alaskan Natives for cultural and subsistence purposes. 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. Subsistence hunters have frequently expressed important concerns about the effects of seismic and drilling noise on bowhead whales. These concerns have been expressed in correspondence, public hearings, a 1997 seismic workshop, and a 1999 OCS Policy Committee Meeting. The Arctic Region Biological Evaluation cites information from the study which may help address potential critical habitat questions.

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 of the proposed Beaufort Sea Sale 176 EIS and development monitoring.

Revised Date: January 2001

Region: Alaska

Planning Areas: Beaufort Sea, Chukchi Sea

Type: Cooperative Agreement with ADF&G

Title: Monitoring Key Marine Mammals: Arctic

Actual Costs (in thousands):
FY1996 - $368
FY1997 - $ 10
FY1998 - $165
Total Cost: $543

Period of Performance: FY 1996-2001

Conducting Organization: ADF&G

Description:
Background Ringed seals have been identified as a "keystone" species in the Arctic marine environment. They represent a top-level predator in the food chain and an abundant species that occurs on the OCS year-around. Their distribution is affected by operations, and their abundance probably could be affected by a substantial oil spill. During 1985-1987 a program conducted by the Alaska Department of Fish and Game (ADF&G), with support from the MMS, developed a formal protocol for aerial surveys to monitor the distribution and abundance of ringed seals off the coast of northern Alaska. Using this protocol, ringed seal surveys were conducted during 1985, 1986, and 1987 along the Beaufort Sea coast. The 1989 monitoring report described their typical abundance and noted the range of natural variation. Since then, site-specific data have been collected during industry exploratory operations. All of this information was reviewed before additional monitoring surveys were conducted.

Objectives

1. Review and define the previously established protocol for monitoring ringed seals by aerial surveys.

2. Estimate relative abundance and density of molting ringed seals on fast ice in the Beaufort Sea during 1996-1998 and compare these estimates with data collected during 1985-1987.

3. Correlate ringed seal densities on fast ice with environmental parameters.

4. Determine abundance and density of molting ringed seals at and near industrial operations, and compare these with otherwise comparable nonindustrial areas.

5. Review adequacy of ringed seal data collected by past industry site-specific monitoring programs and make recommendations for protocols to be used in future industry studies.

6. Provide reports of findings that result from ringed seal monitoring to local residents and subsistence users.

7. Prepare manuscripts for publication including:
   a. The results of this study and a comparison of recent data with data from surveys in 1985-1987.
   b. The results of previous studies of the winter ecology of ringed seals.

Methods Significant improvements over the established protocols for ringed seals 1985-1987 surveys will include navigation by Global Positioning System and direct computer entry of all sightings and other data. In the first year, data were re-analyzed and monitoring protocols evaluated. Limited aerial flights were flown to test methods and to gather initial data on seal numbers in areas of industrial interest in the central Beaufort Sea. In subsequent years, extensive surveys were conducted throughout the U.S. Beaufort Sea, methods were evaluated, and analysis of seal distribution and abundance began. In the final year data analysis and reporting will be completed and papers will be prepared for publication. Data from this study will be compared with the baseline data of previous studies.

Importance to MMS This study will provide a sound, scientific protocol for aerial surveys to evaluate ringed seals in the Beaufort Sea area. Updated information on important biological populations in proposed oil- and gas-lease-sale areas is used for EIS's and postlease assessments. Population estimates derived during this study facilitate postsale mitigation. The study will also provide information that addresses public concerns raised during outreach efforts.

Date Information Required: The products produced from this study could be used in the immediate future as they pertain to postlease Beaufort Sea Sale 144, for postlease permit approvals for Northstar and Liberty, and for the Beaufort Sale 176 EIS, scheduled for 2002.

Revised Date: January 2001

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2002-2003

Region: Alaska

Planning Area: Beaufort Sea

Type: Contract

Title: Bowhead Whale Feeding in the Eastern Alaskan Beaufort Sea: Update of Scientific and Traditional Information

Actual Costs (in thousands):
FY1997 - $ 625
FY1998 - $ 376
FY1999 - $1,400
Total Cost: $2,401

Period of Performance: FY 1997-2001

Conducting Organization: LGL Limited Environmental Research Associates

Description:

Background 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, is being studied to yield more definitive quantitative estimates. The study updates and improves on a major scientific report, which estimated that the eastern Alaskan Beaufort Sea is not an important feeding habitat for bowhead whales.

Objectives

1. Quantify the importance of the eastern Alaskan Beaufort Sea as a feeding area for bowhead whales.

2. Compare with appropriate literature and other available sources, including traditional-knowledge sources, for previous years.

3. Update available information on disturbance to feeding bowhead whales.

4. Characterize the ambient acoustic environment in the eastern Alaskan Beaufort Sea and predict sound levels of oil-and-gas-industry activity received by potentially feeding whales.

Methods

Phase 1/Year 1 - Planning: The study contractor/cooperators conducted a workshop and series of subsequent project meetings that designed, refined, and recommended hypotheses for evaluating/

estimating the importance of the eastern Alaskan Beaufort Sea as a feeding area for bowhead whales. Workshop and meeting attendees included representatives of the North Slope Borough (NSB), Alaska Eskimo Whaling Commission (AEWC), Kaktovik Whaling Captains Association, MMS, National Marine Fisheries Service and an Inupiaq-language translator.

Technical activities considered by the group in Kaktovik, Alaska, included, but were not limited to:

1. Analysis of the amount and condition of prey found in whale stomachs at Kaktovik and the stomach capacity of known-length whales.
2. Aircraft observation of area whale behaviors and any near-surface prey concentrationsl
3. Small-vessel plankton tows prior to and during the fall migration.
4. Satellite imagery of relative marine-nutrient and other oceanographic conditions.
5. Identification of bowhead feeding areas through analysis of radio-isotope ratios in the baleen.
6. Computer modeling of feeding information to determine the relative importance of the eastern Alaskan Beaufort Sea to the bowhead whales.
7. Acoustic characterization of potential feeding areas in the eastern Alaskan Beaufort Sea. Use of these data with existing noise-spreading models to predict sound levels received by feeding bowhead whales from hypothetical oil-industry noise sources at representative nearshore locations.

Proposed out-year research was subsequently presented to a Scientific Review Board (SRB) which included representatives from AEWC and NSB. The SRB concluded that a separate option for tracking bowhead whales using satellite tags, while not within the current budget, presented "a significant potential to provide information relevant to many questions concerning bowhead behavior and utilization (*i.e.*, residence time) of the eastern Alaska Beaufort Sea."

Phase 2 - Field Work, Data Analysis, and Knowledge Synthesis: Guided by the SRB, the research has focussed on analyses of stomach contents, 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.

Importance to MMS The potential disturbance to bowhead whales by oil- and gas-industry activities and the importance of the eastern Alaskan Beaufort Sea to feeding bowhead whales were a partial basis for an MMS decision to adopt the Beaufort Sea Sale 144 Barter Island Deferral option. 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. Information from the study was cited in the Arctic Region Biological Evaluation and may help address potential critical habitat questions.

Date Information Required: The information is needed in time for incorporation in the Beaufort Sea Sale 176 DEIS and EIS, now expected in the next 5-Year Plan.

Revised Date: January 2001

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):
FY1998 - $175
Total Cost: $175

Period of Performance: FY 1998-2001

Conducting Organization: UAF CMI

Description:

Background A protocol for monitoring ringed seal distribution and relative densities in Arctic waters has already been developed for MMS and 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. Good information exists on ringed seal ecology and distribution in industrial versus control areas, but not enough to estimate true densities correctly. Correction factors developed for harbor seals have been found to be applicable to other years, as long as they and the survey estimates were developed 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 factor 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. Useful quantitative information on ringed seal behavior will also be obtained, as identified in the methods section.

Methods Subnivean lairs will be located by dogs trained to alert handlers to ringed seal scents on command. Each year, the use of 20 subnivean lairs by seals will be monitored using air temperature recorded in lairs by thermistor sensors connected to data loggers. The cumulative frequency of lair use by date will be compared among years. During each aerial survey, the proportion of lairs still active will be calculated based on the temperature records. A sample of seals will be instrumented with radio- and ultrasonic-transmitters and their behaviors recorded by observers stationed on the ice surface. Ringed seals not visible during aerial surveys will be partitioned into those under the ice and those in subnivean lairs. Quantitative information will be obtained, including:

1. The temporal pattern in which ringed seals abandon lairs and begins to bask.

2. The proportion and variance of the out-of-water population of ringed seals concealed within subnivean lairs during aerial surveys.

3. The proportion and coefficient of variation of the population visible during aerial surveys.

4. The frequency distribution of distances traveled between winter home ranges and sites occupied during the spring basking period.

5. The relationships between date, distance to ambush cover, and group size for seals visible next to basking holes and cracks.

Importance to MMS Offshore production of oil in the Beaufort Sea is planned for the Northstar and Liberty. 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 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 Liberty Development and Production Plan EIS.

Revised Date: January 2001

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2002-2003

Region: Alaska

Planning Areas: Beaufort Sea, Chukchi Sea

Type: Interagency Agreements with USGS Biological Resources Division

Title: Polar Bear Den Surveys

Actual/Estimated Costs (in thousands): **Period of Performance:** FY 1999-2002

FY1999 - $ 40
FY2000 - $ 17
FY2001 - $150
FY2002 - $150
Total Cost: $357

Conducting Organization: USGS Biological Resources Division

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 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 1, Phase II would further develop (and possibly purchase) appropriate remote sensing technology and design a repeatable survey protocol for surveying polar bear dens. Working cooperatively 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 the Liberty Development and Production Plan EIS and related monitoring baseline.

Revised Date: January 2001

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):
FY1999 - $150 (BRD)
Total Cost: $150 (BRD)

Period of Performance: FY 1999-2001

Conduction 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 This study has been designed to 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. Computer program modules will be developed 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 A model of polar bear population dynamics will be developed and used 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. 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 would be modeled. The interactive model, compatible with MMS hardware and software standards at the time of completion, and a user-friendly manual shall be explained and demonstrated to MMS biologists for their use in varying data input and model assumptions as appropriate for future lease sales.

Importance to MMS Polar bears, which are hunted for subsistence, 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 the Liberty Development and Production Plan EIS.

Revised Date: January 2001

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

Estimated Costs (in thousands):
FY 2001 $200 - $300
Total Costs: $200 - $300

Period of Performance: FY 2001-2002

Conducting Organization: to be determined

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", to be completed in 2000. This follow-on study will compare that information with available bowhead distributional and behavioral data. Specific hypotheses will be tested to determine statistical significance of relationships of key variables.

Objectives The goal is to determine 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) to a Scientific Review Board.

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 This study will 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. It will consider positions and daily activity status of each drilling platform, helicopter, icebreaker, and other support vessels. It will adopt similar measures between years to facilitate inter-year comparisons and trend analysis. It will control for presence of commercial vessels, subsistence hunting, and low-flying aircraft. It will 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. Using appropriate inferential statistical procedures, it will then test hypotheses for significant relationships of human activities and bowhead distribution and evaluate power of tests. A final report will be produced, 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 long-standing concerns about oil-industry activity raised by subsistence whale hunters. It addresses site-specific information needs expressed by oil-industry representatives at previous government workshops on developing site-specific monitoring guidelines. It addresses 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 the Liberty Development and Production Plan EIS and for post-lease permit approvals for all Beaufort Sea sales (Sales BF, 71, 124, 144, 170, and 176).

Revised Date: January 2001

Region: Alaska

Planning Area: Beaufort Sea

Type: Joint Funding/Inter-agency

Title: Testing Bowhead Whale Responses to Offshore Oil-and-Gas-Development Noise

Estimated Costs (in thousands):
FY 2001 - $160 - $240 (MMS Portion)
FY 2002 - $440 - $660 (MMS Portion)
Total Cost- $600 - $900 (MMS Portion)

Period of Performance: FY 2001-2002

Conducting Organization: to be determined

Description:

Background The study addresses bowhead whale responses to oil-industry noise, especially mesoscale responses of individual whales deflected by active seismic vessels. It measures received sound levels and distances from oil-industry activities at which behavior and physiology of individual whales are affected, thus making them harder to hunt, and when affected whales return to their normal migration after passing industrial activities. The study relies on actual ongoing sound levels rather than on predicted or spot-checked levels. Study information also addresses concerns on where and how long migrating whales stop to feed, how individuals respond to multiple sound sources, whether some whales migrate farther north than reported, and where fall whales go after passing Barrow, Alaska. The study will be conducted in cooperation with other concerned entities, with partial funding from the oil and/or seismic industries. The MMS will fund Phase I and part of Phase II, contingent on adequate logistic support provided by industry for implementing Phase II field work.

Objectives The goal is to confirm actual received sound levels and measured distances at which individual bowheads respond to seismic and other oil-industry noise. Specific objectives are to:

Phase I (Year 1)

1. Involve subsistence whale hunters in project planning and potential testing for Phase II.

2. Assemble and test satellite and/or retrievable tag packages for bowhead whales that record geographic position, time, heart rate, dive depth, and underwater sound levels.

Phase II (Year 2)

3. Attach transmitter packs to bowheads prior to the fall migration and track tagged whales in real time across the Alaskan Beaufort Sea.

4. Activate an industry-sponsored airgun array west of tracked whales and monitor their approach, diversion, and course resumption west of an industry-sponsored test vessel.

5. Correlate geographic positions, dive depths, heart rates, surfacing rates, and whale calls with known source levels, received sound levels, and measurable distances from noise sources.

6. Determine actual received sound levels and distances from industry noise at which tracked whales divert and/or their physiological patterns are altered.

7. Observe/detect startle effects when seismic airguns are turned on and any cumulative effects of repeated exposures to oil-and-gas-industry noise.

8. Analyze ancillary data on the time spent by tracked whales in various geographic areas and correlate with any available observations of whale feeding.

Methods PHASE I (Year 1): Use off-the-shelf or previously tested components to assemble, integrate, and field-test a satellite/retrievable tag (and appropriate attachment device) for bowheads that logs precise geographic position, time, heart rate, dive depth, and underwater decibel levels. Minimize potential interference with fall whale hunting by involving AEWC and Whaling Captains Associations in Barrow, Nuiqsut, and Kaktovik, Alaska, in the planning, scheduling, and implementation of potential Year 2 tests. Obtain Federal Permits and other authorizations for tagging and exposing tagged whales to industry noise. Coordinate seismic-vessel participation with any industry activities planned for 2002 PHASE II.(Year 2): In cooperation with other agencies, implement objectives 3-8 (above). Monitor responses of tagged whales to other industrial activities and/or prerecorded sounds to detect potential cumulative effects on individuals exposed to multiple sound sources. Ancillary data on instrumented whales will be analyzed over the life of the tags or until tags are retrieved.

Importance to MMS Study results will help implement mitigating measures such as Sale 170 stipulations on "Industry Site-Specific Bowhead Whale Monitoring" and "Conflict Avoidance Mechanisms to Protect Subsistence Whaling and Other Subsistence Activities". It addresses needs identified at the Arctic Seismic Synthesis and Mitigating Measures Workshop (OCS Study, MMS 97-0014), concerns on seismic operations and "skittish" whales presented to the OCS Policy Committee (May 26-27, 1999), and concerns on multiple exposures to noise discussed at Workshop on the Design of Studies Needed for the Evaluation of Cumulative Impacts of Oil and Gas Exploration and Production on Fall Migrating Bowhead Whales and the Fall Bowhead Subsistence Hunt (Nov. 6-7, 2000).

Date Information Required: The information will be needed for post-lease Exploration Plans in the Beaufort Sea, post-lease activities supporting Development and Production Plans (DPP) at Northstar and Liberty, as well as future DPP's and EIS's.

Revised Date: January 2001

Region: Alaska

Planning Areas: Beaufort and Chukchi Seas

Type: USGS Biological Resources Division

Title: Distribution and Movements of Spectacled Eiders in the Beaufort Sea

Estimated Costs (in thousands):
FY 2001 - $202 (BRD)
FY 2002 - $177 (BRD)
FY 2003 - $198 (BRD)
FY 2004 - $ 26 (BRD)
Total Cost: $604 (BRD)

Period of Performance: FY 2001-2002

Conducting Organization: USGS Biological Resources Division

Description:
Background During interagency discussions of the Northstar pipeline alternatives, spectacled eider use of Beaufort Sea waters was a prominent topic. The U.S. Fish and Wildlife Service Northstar Biological Opinion summarized the small amount of information available concerning spectacled eider distribution and use of the Beaufort Sea. Of 15 males tracked by USGS-BRD satellite telemetry between June 10 and July 10, half traveled from Prudhoe Bay to the Chukchi Sea in the 3 days between satellite relocations, so no information on route or Beaufort Sea use was obtained. Five males spent 7-11 days in Harrison Bay and there were 6 detections in western Simpson Lagoon. Females occupy Beaufort marine habitats over a more extended period, from late June to mid-September. Of 13 females tracked, 10 were located at least once before they arrived in the Chukchi Sea. Locations indicated an average residence period of 4 days. Females generally were farther offshore (average 22 km) than males (average 10 km). Little use is made of marine habitats by either sex prior to these molt migrations. Data on spectacled eiders acquired from the "Monitoring Beaufort Sea Waterfowl and Marine Birds" aerial surveys could be integrated with this study data.

Objectives The basic goal of this study is to determine the timing and extent of use of Beaufort Sea waters by spectacled eiders staging prior to their annual molt migration. Specific objectives are to document:

1. The chronology of transition from terrestrial (nesting) to marine habitats (staging/migration).

2. Spectacled eider timing of use and dispersal to specific Beaufort Sea areas, and the residency times of staging males and females in these areas.

3. Movements of staging/migrating spectacled eiders in the Beaufort Sea and timing of departure.

Methods This project is expected to require the annual effort of a minimum of 3 persons in the field for 4 weeks, including aerial surveys for 10 days (4 hr/day), to locate prospective individuals for instrumentation. Individuals to be instrumented with satellite transmitter tags will be located on nesting areas, using ground search and/or aerial survey techniques. Standard techniques will be used to capture, handle, and instrument eiders. Standard satellite telemetry techniques will be used to determine timing of use, residency times, movements, and routes traveled by instrumented eiders. The study will be coordinated with other ongoing government and industry waterfowl studies in the Beaufort region.

Importance to MMS The vulnerability to oil spills of spectacled eiders (and that of other eiders and oldsquaw) is a continuing concern regarding OCS developments. Data from this study will provide improved definition of the risk to this ESA-listed species. Also, it will provide information on marine distribution and habitat used by spectacled eiders allowing improved definition of mitigating measures required to reduce the number of situations with potential for incidental take.

Date Information Required: Information will be required for post-lease assessments for the Northstar and the Liberty projects.

Revised Date: January 2001

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2002-2003

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 2001-2002
FY 2001 - $60 (BRD)
Total Cost: $60 (BRD)

Conducting Organization: USGS Biological Resources Division

Description
<u>*Background*</u> 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 Polar bear locations obtained by satellite radio-telemetry will be associated 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.). This information will be obtained 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 GIF 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. ARC/INFO will be used to extract ice habitat attributes and attach those attributes to polar bear locations. Habitat preferences and avoidance will be analyzed using log-linear statistical models. Habitat use will be compared 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. Concerns of polar bear welfare raised in environmental impact statements can be addressed by 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: This study supports the Beaufort Sea Lease Sale scheduled for 2002 and future exploration and development activity.

Revised Date: January 2001

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 2000-2002
FY2000 - $75
Total Cost: $75

Organization Conducting: UAF CMI

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 provided 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) have provided 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. Belugas have been captured and instrumented 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-FJMC tagging venture in the Mackenzie estuary. This study builds on a pilot study initiated in July 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. Determine seasonal movements and diving behavior of the Chukchi Sea and eastern Bering Sea beluga whales. Determine which regions of the pack ice they use after leaving coastal summer concentration areas. Determine 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 increase our knowledge of the migratory movements, wintering behavior, and feeding areas of belugas in Arctic waters. Information from this study will be used in support of environmental assessments for Arctic lease sales. This study is especially pertinent due to the prominence of beluga whales in Alaskan Native culture and subsistence practices. This information will be needed for post-sale mitigation and exploration plan reviews.

Date Information Required: The study will provide information to support as yet unspecified future lease sales and oil and gas developments in the Beaufort Sea. 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: January 2001

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2002 - 2003

Region: Alaska

Planning Areas: All Alaska Planning Areas

Type: Cooperative Agreement with the ADF&G, Subsistence Division

Title: Sociocultural Consequences of Alaska OCS Activities: Data Analysis/Integration

Actual Costs: (in thousands)
FY 1996- $583
FY 1997- $ 0
FY 1998- $ 15
FY 1999- $ 0
Total Cost: $598

Period of Performance: FY 1996-2001

Organization Conducting: ADF&G, Subsistence Division

Description:

Background The Alaska OCS Region has implemented an important socioeconomic component of its overall Environmental Studies Program, resulting in the publication of 160 Technical Reports (TR's) addressing Statewide socioeconomic-study topics. Methodological approaches have included case studies, institutional-profile analyses and analyses of secondary-source materials, modeling and econometric analyses, 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.

Objectives This study includes two components conducted simultaneously. The first is a formal, comparative, quantitative, and qualitative analysis of existing data that documents changes in the human environment related to OCS activities. The second is local-level constituent participation in sociocultural information review and monitoring of social change.

Methods

1. Analyze and integrate subsistence, economic, and sociocultural time-series data from previous MMS-sponsored projects ("Sociocultural Consequences of Alaska OCS Activities: Data Analysis and Integration," "Subsistence Harvest Data: Bering Sea," and "An Investigation of Sociocultural Consequences of OCS Development in Alaska").
2. Provide comparative data analysis within and among Alaska's OCS planning areas.
3. Provide unique information about socioeconomic change at the household and community levels for *Exxon Valdez* oil-spill-affected communities.
4. Cooperate with State agencies and community organizations in assessing the occurrence and

implications of documented sociocultural change.

5. Design and implement effective communication of study results to local communities.

Importance to MMS The reason for doing this study would be to learn, in a structured way, the social effects from OCS activities on the coastal communities of Alaska. The MMS foresees using thc products of this study to assist NEPA-document preparation, prepare mitigating measures, review oil-spill-contingency plans, prepare for and dialog with coastal communities regarding the MMS program, and review and formulate offshore policy for Alaska. Providing the analytical results to our staff and the public will aid our difficult task of gaining public support for the MMS mission regarding offshore Alaska.

Date Information Required: The contractor will complete the project by mid-2001. The deliverables provide pre- and postlease information in support of lease sales that probably will be proposed in the "OCS Oil and Gas Leasing Program: 2002-2007" in the Beaufort Sea, Cook Inlet, Gulf of Alaska, and Chukchi Sea/Hope Basin; assist ongoing outreach efforts initiated by the Alaska OCS Region; and provide input into future socioeconomic-study proposals.

Revised Date: January 2001

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PIAN FY 2002 - 2003

Region: Alaska

Planning Areas: All Alaska Planning Areas

Type: Contract

Title: *Exxon Valdez* Oil Spill, Cleanup, and Litigation: A Community-Based Collection of Social-Impacts Information and Analysis, 1989 - 2001

Actual Costs: (in thousands)
FY 1997- $123
FY 2000- $ 30
Total Cost: $153

Period of Performance: FY 1996-2001

Organization Conducting: Impact Assessment, Inc.

Description:
<u>*Background*</u> The oil spill from the *Exxon Valdez* grounding not only contaminated natural habitat and resources but also produced a cleanup effort that was a major causal agent for ongoing social impacts among communities in southcentral Alaska. The effects from the oil spill, cleanup, and subsequent litigation have been documented variously in media coverage and by research initiated by MMS, the Alaska Conference of Mayors, the State of Alaska, Federal resource and response agencies, academic institutions, and individual researchers.

<u>*Obiectives*</u>

1. Collect, organize and synthesize all community-based social information associated with the *Exxon Valdez* oil spill, cleanup, and associated litigation for the period 1989--the year of the spill--through 2001 that shows the effects on the human environment.

2. Identify key social factors and analyze the literature by these factors showing effects resulting from the *Exxon Valdez* oil spill, cleanup, and litigation. Solicit input and concurrence of the key social factors from representatives of MMS, the State of Alaska, local communities, and Native organizations.

3. Prepare a CD-ROM, which is PC-based, containing an annotated bibliography, abstracts, social factors, and analytical findings of this study.

Methods A formal, comparative quantitative and qualitative analysis of existing data that documents changes in the human environment related to *Exxon Valdez* oil spill, cleanup, and litigation was conducted. Social factors important to understanding and analyzing the community-based social effects resulting from the *Exxon Valdez* oil spill, cleanup, and litigation were identified. At a minimum, these social factors include social organization (including kinship networks), cultural values, social health, access to subsistence resources, subsistence hunting, and the use of subsistencc resources. Pertinent literature was analyzed and the effects of the *Exxon Valdez* oil spill, cleanup, and litigation were evaluated according to the social factors. This evaluation was cross-referenced by social factor, literature source, and community. The final products of this study (annotated bibliography, abstracts, social factors, and a summary of the analytical findings) will be entered on the CD-ROM, which is PC-based. The CD-ROM is intended to be publicly available and can be queried on social factors, key words, author, title and community.

Importance to MMS The reason for doing this study was to learn, in a structured way, the localized social effects from spilled oil, cleanup, and litigation on the coastal communities of Alaska. The MMS foresees using the products of this study to assist NEPA-document preparation, prepare mitigating measures, review oil-spill-contingency plans, prepare for and dialog with coastal communities regarding the MMS program, and review and formulate offshore policy for Alaska. Providing an analytical tool for our staff and to the public would benefit our difficult task of gaining public support for the MMS mission regarding offshore Alaska.

The process and products from this study may serve as a prototype for similar future data synthesis of large information databases. While this study focuses on social information of the *Exxon Valdez* oil spill, similar tasks could be applied to the physical and biological sciences.

Date Information Required: The Contractor will complete the project by mid-2001. The deliverables provide pre- and postlease information in support of lease sales that probably will be proposed in the "OCS Oil and Gas Leasing Program: 2002-2007" in the Beaufort Sea, Cook Inlet, Gulf of Alaska, and Chukchi Sea/Hope Basin; assist ongoing outreach efforts initiated by the Alaska OCS Region; and provide input into future socioeconomic-study proposals.

Revised Date: January 2001

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2002 - 2003

Region: Alaska

Planning Areas: Beaufort Sea, Chukchi Sea

Type: Cooperative Agreement with CMI

Title: Subsistence Economies and North Slope Oil Development

Actual Costs: (in thousands) **Period of Performance**: FY 1997-2001
FY 1997- $88
Total Cost: $88

Organization Conducting: UAF CMI and ADF&G, Subsistence Division

Description:
Background This is a study of the mixed, subsistence-cash economies of two Inupiat villages close to areas impacted by petroleum exploration, development, and production activities on the North Slope of Alaska. Kaktovik, Alaska, is a predominantly Inupiat community located on Barter Island, about 160 miles east of Prudhoe Bay. Nuiqsut, Alaska, also is predominantly Inupiat and located along the Colville River about 60 miles west of Prudhoe Bay. Kaktovik and Nuiqsut are the communities closest to oil exploration, development, and production activities on the North Slope. Land and coastal marine areas used by households for subsistence production have been affected by oil exploration, development, and production activities.

To track changes in subsistence and employment patterns on the North Slope, the ADF&G, Division of Subsistence, in collaboration with other agencies including the MMS, has conducted comprehensive household surveys in Kaktovik and Nuiqsut. Information in the datasets includes subsistence-harvest quantities at the species level, household employment by industry and job type, income levels, demographic composition of households, sharing of subsistence resources, and mapped information of subsistence harvest-areas. Multiple surveyed years using the same questions allow for comparative analyses to assess patterns of continuity and change over time. This study allows this type of analysis.

Obiectives This study analyzes the continuity and change in the subsistence and wage-employment activities of households in Kaktovik and Nuiqsut.

Method This study analyzes comprehensive quantitative datasets on subsistence production and distribution and employment by households that were collected for selected years in Kaktovik and Nuiqsut. Findings of the statistical analysis were augmented and interpreted by additional qualitative information collected through key respondent interviews of hunters in Kaktovik and Nuiqsut. Findings were compared with subsistence harvest-data from other villages reliant on caribou and marine resources.
Importance to MMS Lease sales probably will be proposed in the "OCS Oil and Gas Leasing Program:

2002-2007" in the Beaufort Sea located in and near areas of productive subsistence. The OCS exploration, development, and production activities could affect this subsistence production. This study will provide improved analytic tools to assess potential impacts and to make decisions to mitigate potential impacts.

Date Information Required: The information is required by 2001 for postlease assessment in relation to Beaufort Sea Lease Sale 170 and prelease assessment for lease sales that probably will be proposed in the "OCS Oil and Gas Leasing Program: 2002-2007" in the Beaufort Sea.

Revised Date: January 2001

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2002 - 2003

Region: Alaska

Planning Areas: All Alaska Planning Areas

Type: Contract

Title: Update Oil Industry Labor Factors for Alaska Manpower Model

Actual Costs (in thousands)
FY 1998- $132
FY 2000- $ 11
Total Cost: $143

Period of Performance: FY 1998 - 2001

Organization Conducting: Jack Faucett & Associates

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. Determine number of workers and amount of time needed to complete the tasks and subtasks defined in the Manpower Model.
3. Determine 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 postlease mitigation.

Date Information Required: This information will be useful for EIS's for lease sales that will probably be proposed in the Arctic in the "OCS Oil and Gas Leasing Program: 2002-2007."

Revised Date: January 2001

Region: Alaska

Planning Area: Cook Inlet

Type: Cooperative Agreement with CMI

Title: An Economic Assessment of the Marine Sport Fisheries in Lower Cook Inlet

Actual Costs (in thousands)
FY1997 - $141
Total Cost: $141

Period of Performance: FY 1997-2001

Description:

Background The marine sport fisheries of lower Cook Inlet are the focus of a rapidly expanding tourist economy. Sport fisheries produce non-monetary benefits to fishermen and monetary benefits to tourism-related businesses. The sport fisheries of lower Cook Inlet contribute to the economic well being of residents of the Kenai Peninsula, Alaska, and the nation. While there is considerable information regarding the economic value and impact of commercial fisheries off Alaska, the economic value and impact of sport fishing activities have not been rigorously evaluated.

Objectives The objective of this study is to produce an econometric model that is capable of analyzing the effects of changes in the sport-fishing opportunity on angler net benefits and ultimate impact of those changes on the regional economy through evaluation of various scenarios. This in turn will provide the capability to analyze potential effects of OCS lease-sale and postlease activities.

Methods The Impact Analysis for Planning econometric model (IMPLAN) will be used initially. The IMPLAN database and model has been modified for use in regional analysis of the Kenai Peninsula region. A series of focus-group meetings were held in communities on the Kenai Peninsula in conjunction with other community-research methods as deemed necessary. Following verification and ground-truthing of the IMPLAN Kenai Peninsula model now completed, necessary information will be extracted for use in the Fishery Economic Assessment Model (FEAM). Disaggregation of commercial- and recreational-fisheries-related sectors will occur during this step. Impact analysis will be performed to estimate direct, indirect, and induced effects on income and employment by industry and aggregated industries. A regional input/output model will measure the impact of marine sport fisheries on the Kenai Peninsula economy.

Products Documentation of the complete input/output model and an econometric description of the contingent-valuation-method model, final report, peer-reviewed publications, oral presentations for interested groups on request, and journal article.

Importance to MMS Leases held in Cook Inlet are located in and near productive commercial, subsistence, and sport-fishing grounds. OCS exploration, development, and production activities could affect the sport-fishing and related sectors of the regional economy, the quality of sport-fishing recreational opportunities, and the demand for tourism-related services. This study will provide improved analytic tools to assess potential impacts and to make decisions to mitigate potential impacts.

Date Information Required: The information is required for environmental assessment related to activity on Cook Inlet leases and an EIS for a possible lease sale in the Oil and Gas Leasing Program 2003 to 2008.

Submitted by: Alaska OCS Region

Revised Date: January 2001

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):
FY1997 - $142
FY1998 - $110
FY1999 - $120
FY2000- $44
Total Cost: $416

Period of Performance: FY 1997-2002

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 Inupiat epistemology.

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. The products of this study will be used to assist NEPA-document preparation, prepare mitigating measures, review oil-spill-contingency plans, 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: Interim products will provide information for the Beaufort Sea Sale 176 EIS, the Liberty Development and Production Plan EIS. The final products will be used for NEPA documentation for future Beaufort Sea Lease Sales and development plans and programs.

Revised Date: January 2001

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 Alaska OCS

Actual Costs (in thousands):
FY1998 - $349
Total Cost: $349

Period of Performance: FY 1998-2002

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 NEPA documentation for future Beaufort Sea Lease Sales and development plans and programs and ongoing outreach efforts, and for future socioeconomic-study proposals.

Revised Date: January 2001

Region: Alaska

Planning Area: Beaufort Sea

Type: Cooperative Agreement with CMI

Title: Regional Economic Impact Analysis of Subsistence Bowhead Whaling: Accounting for Non-Market Activities on Alaska's North Slope

Actual Costs (in thousands):
FY 2000 - $55 (Objective 1, see Method 1)
FY 2000 - $60 (Balance of FY 2000)
FY 2001 - $92
FY 2002 - $89
Total Cost: $296

Period of Performance: FY 1999-2003

Conducting Organization: UAF CMI

Description:
Background Subsistence activities by Inupiat of the North Slope including whaling are difficult for contemporary western researchers to evaluate or to quantify. Two economic theories, home production theory and regional, input-output modeling (IMPLAN) are appropriate for policy and resource development analysis in Alaska and analysis of the economics of subsistence whale harvest. Using these two theories and gathering data to apply to the theories can help answer questions more precisely about the economics of subsistence whale harvest. Barrow, Nuiqsut, and Kaktovik are the primary communities where subsistence whale hunting is done that potentially could be impacted by OCS activities in the Beaufort Sea.

Objectives The overall objective of this study is to provide community economic profiles and a working regional economic model for the communities of Barrow, Kaktovik, and Nuiqsut.

Methods

1. Obtain approval of the Barrow, Kaktovik and Nuiqsut communities to gather data and do the study.

2. Update the IMPLAN database to accurately reflect the Barrow, Kaktovik, and Nuiqsut cash economies.

3. Determine a format for collection of information concerning the household economy from stakeholders in collaboration with representatives of the three communities.

4. Obtain information concerning the household economy from the primary stakeholders through focus groups.

5. Draft a survey questionnaire and obtain approval from the Office of Management and Budget.

6. Obtain information regarding the household economy from the community using a survey questionnaire.

7. Modify and test the IMPLAN Model and develop the Community Profile.

8. Coordinate this study with the study "Quantitative Description of Potential Impacts of OCS Activities on Bowhead Whale Hunting and Subsistence Activities in the Beaufort Sea and Recommended Mitigation including Compensation"

Importance to MMS MMS can use the modified IMPLAN model to predict potential impacts in pre-lease and pre-development environmental impact statements. This project can also provide an important baseline assessment for future comparisons. Application of the Model to subsistence bowhead whaling off the north coast of Alaska, specifically the Beaufort Sea, will depict the unique features of this cash/non-cash economy. Working in partnership with the North Slope Borough Department of Wildlife Management and the Barrow, Kaktovik, and Nuiqsut communities will assure accurate and reliable information and ownership of the model by community members. This study will provide comprehensive economic methodologies depicting non-formal, subsistence sectors prevalent in rural Alaska economies.

Date Information Required: This information will be used for post-lease environmental assessments after Beaufort Lease Sale 176 scheduled for 2002 and for lease sale EIS's in the Beaufort Sea which will probably be scheduled in the next Five-Year Program.

Revised Date: January 2001

Region: Alaska

Planning Areas: Beaufort and Chukchi Seas and Hope Basin

Type: Joint Funding/Inter-agency

Title: Traditional Knowledge/Western Science Bowhead Whale Migration Seasonal Report

Estimated Costs (in thousands): $60 - $90 (MMS Portion)

Period of Performance: FY 2001-2003

Conducting Organization: to be determined

Description:

Background The MMS will continue incorporating pertinent traditional knowledge in its EIS's. The wealth of Native observations on area wildlife, particularly bowhead whales, is vital to this effort. This project would synthesize valuable input by subsistence-whale hunters and others concerning annual bowhead whale migrations. Observations about particular bowhead migrations are not readily available to non-Natives. Scientific and regulatory information relative to bowhead migrations is not always readily available to Native villagers in a reader-friendly format. The synthesis of this information provides an unprecedented opportunity for MMS to bridge the gap between traditional knowledge and scientific results.

Objectives

1. Offer a pilot forum for observations by government-agency and oil-industry scientists, subsistence-whale hunters, and the subsistence-whaling community focused on the spring and fall migrations of the bowhead whale.

2. Provide a synthesis of scientific results and Inupiat observations of bowhead whale behavior.

Methods Twice annually for 3 years, the pilot forum would gather information put in a reader-friendly report that includes narrative descriptions by the Whaling Captains' Associations in Barrow, Nuiqsut, Kaktovik, and St. Lawrence Island about the:

1. Bowhead migration near their whaling grounds.

2. Weather and ice conditions.

3. Unusual natural occurrences or whaling incidents.

4. Village whaling success.

The AEWC will report on locations of whale takes, the bowhead migration as a whole, and the annual quota. Each issue could contain photos of whales and related seasonal activities of subsistence-whale hunters and the subsistence-whaling community. This should provide an accurate representation of pertinent Inupiat subsistence hunters' knowledge. The same volume will also summarize in layman's language scientific findings about particular bowhead migrations by the MMS Bowhead Whale Aerial Survey Project, NMFS, National Weather Service, North Slope Borough, oil industry researchers, Russian scientists, and others. The text of the report will contain side-by-side English and Inupiaq-language translations. The information collected from the community will be carefully coordinated with appropriate subsistence organizations. This study presents a joint-funding opportunity that could be established as a cooperative agreement between MMS, the AEWC, and the NSB. A cooperative agreement would ensure whale hunter input and data, proper adherence to protocols, and Inupiat translation expertise. This would be designed to be mutually beneficial to all the parties. This study will be coordinated closely with relevant part of the ongoing study Arctic Nearshore Impact Monitoring in Development Area (ANIMIDA). The relevant part of ANIMIDA is to collect information on bowhead whaling at Cross Island. Reports will be prepared twice annually for 3 years on bowhead migrations. The budget figure above represents the MMS portion of the total budget, which is 50 percent of the total cost of the study.

Importance to MMS Information from the project will be important to the consultation process under the existing stipulations on subsistence whaling and other subsistence activities. Both scientific findings and traditional knowledge have value in interpreting specific bowhead migrations. Making it easy to utilize both bodies of knowledge through the same forum will help administrators avoid misunderstandings, and will, in effect, facilitate a melding of both knowledge systems.

Date Information Required: The reports should be available on a long-term basis (2002 and beyond) to improve communications about industry activity during bowhead whale migrations associated with the Northstar and Liberty projects and future development projects. The study would also facilitate information about postlease exploratory drilling activity deriving from Beaufort Sea Lease Sale 176.

Revised Date: January 2001

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2002-2003

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

Estimated Cost (in thousands): $400 - $600 **Period of Performance:** FY 2001-2003

Description:

Background The residents of Nuiqsut, Kaktovik, and Barrow are closest 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, AEWC, 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, AEWC, 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 Leaders of the North Slope Inupiat communities, including elders, have for many years expressed concern about impacts to their subsistence way of life. These concerns were expressed most recently during a meeting held in Barrow in March 2000. 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 as soon as possible for potential use in ongoing NEPA analyses and formulation of mitigation measures.

Submitted by: Alaska OCS Region

Revised Date: August 2000

Region: Alaska

Planning Area: Beaufort Sea

Type: Contract

Title: Reference Manual and GIS Overlays of Oil-Industry and Other Human Activity (1979-1998) in the Beaufort Sea

Actual Costs (in thousands):
FY1998 - $210
FY1999 - $47
Total Cost: $257

Period of Performance: FY 1998-2001

Conducting Organization: LGL Limited Environmental Research Associates

Description:

Background Analysis of the potential effects on wildlife of oil-industry and other human activities has been limited by the quality and resolution of data available on these activities. This study will provide wildlife scientists, Native organizations, and others with the authoritative historic information on human activity needed to analyze the potential effects of such activities on whale migrations, wildlife distributions, shipwrecks, etc.

Objectives

1. Quantify offshore drilling, seismic exploration, vessel- and helicopter-support activity in the Beaufort Sea in small units that are comparable between areas and years (e.g., line miles shot by area).

2. Quantify other human activity in the Beaufort Sea such as number and types of commercial vessels, subsistence hunting, and aircraft on an annual basis, specifying when and where such human activity occurred.

3. Compile measures for the above human activities in an inter-year, cross-indexed reference manual and as ARC/INFO overlays—both useful for defining "industrial" versus control zones, in identifying between-year trends, and in comparing levels of various types of oil- industry activity with other human activities and wildlife distributions.

Methods

1. Inventory of all published and unpublished records of oil industry activities in Federal and State waters by year for the period 1979 to 1998 in the Alaskan Beaufort Sea. Records include, but are not limited to, Federal, State, oil industry, and oil-industry-support entities.

2. Compile and synthesize all legally available and nonproprietary records on vessel and on-ice seismic, drilling, production, and support activities by area, month, and year. Conduct a similar inventory of other vessel and low-level aircraft activity in or over the Beaufort Sea.

3. Describe the levels for each human activity in the smallest units possible to facilitate subsequent temporal and spatial comparisons between areas, months, and years.

4. Compile measures appropriate to each human activity in an inter-year, cross-indexed reference manual that includes a summary ARC/INFO overlay for each activity during each month and each year.

5. Provide Oracle/SDE geospatial database, users and reference manuals, and training.

Importance to MMS Information from this study will be valuable to the consultative process under the existing stipulation on subsistence whaling and other subsistence activities (Stipulation No. 5, Sale 144). The study will provide the most authoritative source of oil-industry and other human geospatial activity available for the Beaufort Sea during the years 1979-1998. It would address in greater detail many of the concerns about oil-industry activity raised by non-industry groups relative to potential interference with subsistence hunting and whaling. Results of this study will be used to help resolve long-standing concerns over the potential effects of seismic activity.

Final products from the study will be important to decision makers, managers, and scientists for:
1. Making direct comparisons between oil-industry activities and the distribution of wildlife species (bowhead whale migrations, waterfowl, ringed seals) previously monitored in the Beaufort Sea.
2. Comparing drilling activity with monitored water chemistry and chemical contaminants found in archived marine-mammal tissues.
3. Determining potential effects on wildlife by better defining, delineating, and quantifying appropriate industrial-activity and control zones.

Date Information Required: This information is needed for evaluation of postlease exploration plans in the Beaufort Sea and to improve present and planned monitoring of the potential impacts of postlease activity on bowhead whales, ringed seals, and marine mammal tissues in the Beaufort Sea (respective to Sales BF, 71, 124, 144, 170, and 176).

Revised Date: January 2001

Region: Alaska

Planning Area: Beaufort Sea

Type: Competitive

Title: ANIMIDA - Arctic Nearshore Impact Monitoring in Development Area

Estimated Costs (in thousands):
FY1999 - $517
FY2000 - $832
FY2001 - $818
FY2002 - $750
FY2003 - $300
Total Cost: $3,217

Period of Performance: FY 1999-2004

Conducting Organization: Arthur D. Little, Inc.

Description:
Background Residents of the villages of Nuiqsut, Kaktovik and Barrow 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 Sales 170 and 176. Interagency reviews of related EIS's and Development and Production Plans recommend monitoring impacts of Northstar and 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 determined 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 Arctic Nearshore Impact Monitoring in the Development Area (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 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. Phase II (FY's 2000-2003) will include monitoring of Northstar construction and baseline effort for Liberty. The initial Phase II sediment sampling has a focus on the recently completed Northstar Island and pipeline. Source samples have been 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 are being made in the vicinity of Northstar construction, spoils dumps and other sites including local rivers. Sediment and suspended sediment samples are being analyzed for PAH, trace metals, and supporting chemistry. Initial contaminant sampling of biota emphasizes fish. These and other biota are being analyzed for hydrocarbons and persistent organic pollutants. Kelp productivity will be monitored in the Boulder Patch starting in 2001 and will use the inherent optical properties of the ice and water to determine the impact of sediment resuspension on kelp productivity. Optical-related measurements will include spectral irradiance, light scattering coefficients, and total suspended solids. An experienced Arctic ethnographer will be stationed on Cross Island during the whaling season and record the information on whaling locations, success, and whaler perceptions during the first field season. Subsequent years will have goal of working toward a self-reporting arrangement with the whalers. Field programs are also scheduled for 2001 and 2002. Year 5 (FY 2003) will be 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 contract.

Revised Date: January 2001

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2002-2003

Region: Alaska

Planning Areas: Beaufort and Chukchi Seas

Type: Competitive

Title: Statistical Approach to Oil Spill Occurrence Estimaters for the Beaufort/Chukchi Sea OCS

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

Conducting Organization: to be determined

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 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 by Alaska OCS Region staff in preparing the Sale 176 EIS, in preparing future developmental EIS's, and in reviewing oil-spill-contingency plans for OCS and coastal facilities.

Revised Date: January 2001

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2002-2003

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):
FY1998 - $101
FY1999 - $100
FY2000 - $112
FY2001 - $125
FY2002 - $125
Total Cost: $563

Period of Performance: FY 1998-2002

Conducting Organization: UAF CMI

Description:
Background This study provides management of a large ongoing program of scientific research into framework issues related to lease sales scheduled in the OCS 5-year leasing program. 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.

3. Experimental studies for better understanding of environmental processes, or the causes and effects of OCS activities.

4. 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.

5. 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, the Framework Issues, and previous Alaska Region study plans. 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.

Submitted by: Alaska OCS Region

Revised Date: January 2001

Region: Alaska

Planning Areas: All Alaska Planning Areas

Type: Interagency Agreement

Title: Management, Logistics, and Warehouse Storage of Oceanographic Equipment

Actual Costs (in thousands):
FY1997 - $39
FY1998 - $60
FY1999 - $56
FY2000 - $65
FY2001 - $60
FY2002 - $60
FY2003 - $60
Total Cost: $489

Period of Performance: FY 1997-2003

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 facility for our use.

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: January 2001

Region: Alaska

Planning Areas: All Alaska Planning Areas

Type: Contract

Title: Conference Management and Reports on MMS Results

Actual Costs (in thousands):
FY1996 - $100
FY1997 - $ -0-
FY1998 - $153
FY1999 - $45
FY2000 - $117
Total Cost: $415

Period of Performance: FY 1996-2002

Conducting Organization: MBC Applied Environmental Sciences

Description:
Background As discussed in Section 1 Introduction-Background of this ASP, the Alaska 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 (ITMs) 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.

Objectives The objectives are to produce ITM's, small workshops, and publications on OCS environmental studies information. We are planning the eighth Alaska ITM during FY 2000 to be held in March 2001 and anticipate the need for a small workshop later during FY 2001.

Methods The primary method is to provide for the logistical coordination of the meetings, and to help with preparation of publications.

Importance to MMS Continuation of 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. Further development of OCS prospects is anticipated during the next few years. With development, industry-sponsored research probably will provide an increasing portion of the environmental assessment information. This also will increase the need for information transfer and exchange.

Date Information Required: There is an ongoing need for the transfer of studies information, so ITMs or small workshops will be convened as needed, and the dates will be coordinated with lease sales and industry operations.

Revised Date: January 2001

STUDY PROFILES FOR
Alaska Annual Studies Plan FY 2002-2003

Part B. Proposed Studies

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2002-2003

Region: Alaska

Planning Areas: Beaufort, Chukchi, and Bering Seas and Cook Inlet

Type: Joint Funding/Inter-agency

Title: Update Digital Interactive Climatic Atlases

Costs Range (in thousands): **Period of Performance:** FY 2001-2003

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^{o}N. 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, 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 within FY2002 will verify the availability of these digital data sets. A coordination plan would be developed 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 FY 2003 will collect previous digital data for the 1987 climatic atlas and update digital climate data to the present. The data will undergo quality control using both computer and visual techniques to eliminate duplicate observations and questionable elements. The data will be synthesized 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 atlas. Paper climatic data are no longer fully adequate to meet MMS needs. The data will be used for MMS oceanographic modeling efforts and to interpret the occurrence of biological data collected under the studies plan. The current paper atlas data are used by MMS analysts in describing the environment and setting the initial parameters for oil-spill-weathering models. The data are used by MMS and others for oil-spill-contingency planning. Because of expanding 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: January 2001

Region: Alaska

Planning Area: Cook Inlet

Type: Joint Funding/Inter-agency

Title: Drifter Testing and Evaluation for Oil-Spill Trajectory Modeling in Cook Inlet and Shelikof Strait

Cost Range (in thousands): **Period of Performance:** FY 2002 - FY 2003

Description:

Background Over the past eight years, MMS has deployed several hundreds of satellite-tracked drifters for the purpose of measuring the surface currents and simulating oil spills in the Gulf of Mexico. The purpose of these activities was the testing, evaluation, and improvement of MMS's Oil Spill Risk Analysis (OSRA) model applied to the Gulf. However, no such evaluation study has been performed yet in Alaskan waters. Given the considerable differences in the physical oceanographic setting of these two regions, it is necessary to perform the same kind of evaluation of the OSRA model applied to Alaskan waters.

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.

While useful, these past studies provide too little information for a comprehensive evaluation of MMS's oil-spill modeling in this area. Also, there have been no Lagrangian current measurements in the middle and upper Cook Inlet. The study outlined herein emulates the excellent drifter studies performed in the Gulf of Mexico and will help MMS improve its OSRA conducted in support of lease sales in the Alaska Region. The budget figures above represent 50 percent of the cost of the study and assume 50 percent cost participation by other interested agencies.

Objectives The objective is the acquisition of a one-year-long, synoptic, Lagrangian realization of the mesoscale and tidal currents in the Cook Inlet and Shelikof Strait and concurrent meteorological observations, and oil-spill simulations numerous enough for a statistical evaluation of MMS's OSRA model applied to Alaskan waters.

Methods The surface currents will be observed by aircraft-deployed drifters as done in the SCULP and NEGOM projects in the Gulf of Mexico. Ten water-following (SCULP-type) drifters will be deployed every two weeks along the inlet and strait from a chartered aircraft for a total of 260 drifters. In each deployment cycle, two drifters will be deployed in each of the upper and middle of Cook Inlet and Shelikof Strait, and four drifters will be deployed in a rectangular array in the lower Cook Inlet. This deployment scheme may be adjusted later in the project if the earlier deployed drifter tracks suggest a better sampling scheme.

The drifters will be tracked by the ARGOS system employing "multi-satellite" service in order to resolve the strong tidal signal in the currents better. The drifters will transmit for 30 days and then automatically shut off. The choice of 30 days is based on summer salt balance and the potential persistence of emulsified oil.

At selected locations and/or locations of practicality, five oil-following "ARGOSPHERE-type" drifters will be deployed in Cook Inlet and in the Shelikof Strait. They will also be tracked for 30 days using Service ARGOS' multi-satellite service. The shipboard drifter deployments will be made from chartered fishing boats or volunteer fishermen if any can be recruited. Deployments will be concurrent with SCULP drifter deployments.

Finally, NOMAD-type meteorological buoys will be deployed in the area for the one year of drifter observations. The National Data Buoy Center (NDBC) will install the buoys and provide MMS with the digital data. One mooring will be deployed in each of lower Cook Inlet and the Shelikof Strait. Middle Cook Inlet may use an oil-platform based meteorology station and upper Cook Inlet a land-based meteorology station to avoid the seasonal ice pack. Although the tides are the dominate currents most of the time, the locally forced, wind-generated currents will be important too, especially for the oil-spill simulating drifters.

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' environmental impact evaluations in support of leasing in the Alaska region. 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: January 2001

Region: Alaska

Planning Areas: Beaufort Sea, Cook Inlet

Type: Competitive or Joint Funding

Title: Surface Circulation Radar Mapping in Alaskan Coastal Waters: Planning/Feasibility Study

Cost Range (in thousands): **Period of Performance:** FY 2002-2003

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 only data at specific points and not at the water surface, where they 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 feasibility study would be 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 use is 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. Develop information on advantages and disadvantages of competing radar systems for Alaska use. Include costs, resolution (2-D and velocity), deployment issues, maintenance, etc.). Specifically look at limitations of use for near the Liberty prospect in the coastal Beaufort Sea and in Cook Inlet.
2. Establish who potential radar users are and develop communication links.
3. Hold workshop to form users group. Do not limit to those interested only in Beaufort Sea and Cook Inlet.
4. Develop 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, taking into account cost-sharing possibilities.

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 tasking 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 by Alaska OCS Region staff in preparing future development EIS's, lease sale EIS's under the next 5-year schedule, and in reviewing and improving oil-spill-contingency plans, including any for the Liberty Prospect.

Revised Date: January 2001

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

Cost Range (in thousands): **Period of Performance:** FY 2003-2005

Description:

Background Over the past 25 years, oceanographic radar techniques have been developed and improved so that detailed, grided, 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 they 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, 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. This study presumes the development of a users group to cost and use sharing of rented 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 (especially the Liberty Prospect).
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 by Alaska OCS Region staff in preparing future development EIS's, lease sale EIS's under the next 5-year schedule, and in reviewing and improving oil-spill-contingency plans, including any for the Liberty Prospect.

Revised Date: January 2001

Region: Alaska

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

Type: Competitive or Joint Funding

Title: Workshop on Sea Ice Circulation/Interaction Modeling for Nearshore Beaufort and Chukchi Seas

Cost Range (in thousands): **Period of Performance:** FY 2002

Description:

Background 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 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. 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 in the specific problem of modeling fine scale ice/ocean and ice/ice interactions. Recent research efforts outside of MMS are addressing the inclusion of a more sophisticated thermodynamic and ice thickness coupled to a dynamic sea ice model and ice-ice interactions on a one-to-few kilometer scale. Other research efforts have focused on the kinematics approach using discrete element models, which address individual floes. 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. This study will review state-of-the-art ice modeling and provide recommendations as to preferred modeling approaches to advance the state-of-the-art in ice-model resolution. The MMS will use the results of the sea ice-modeling workshop to pursue this advance.

Objectives The objective of this study is to develop a workshop on state of the art of ice or ocean-ice models. The workshop would address how existing, new, or proposed models could be applied to the nearshore Beaufort and Chukchi Seas to meet MMS's needs for oil spill trajectory modeling in ice, including in and among the barrier islands. The workshop participants would make recommendations on "best modeling approaches" based on the MMS's ice modeling needs.

Methods

1. Conduct a workshop inviting ice and ice/ocean modelers to discuss state of the art in ice and ice/ocean models.
2. Provide the MMS's ice modeling needs to workshop participants.
3. Develop recommendations for coupling existing models or developing new models to meet MMS's needs for oil spill trajectory modeling in ice.

Importance to MMS The importance to the MMS is to gain state of the art knowledge on the best direction to proceed on ice modeling prior to investing studies money. This information will allow the MMS modeling group and the Alaska OCS Studies to make an informed decision about the best path to proceed for modeling the nearshore Beaufort and Chukchi Seas. The workshop may also allow for the development of collaborative efforts on ice modeling.

Date Information Required: This study will start in FY 2001 or early FY 2002 to support enhancement of circulation models and review of future oil-spill contingency plans. The information will also be used for Beaufort Lease Sale and Development EIS's.

Revised Date: January 2001

Region: Alaska

Planning Areas: Beaufort Sea, Chukchi Sea, Hope Basin

Type: Competitive or Joint Funding

Title: Sea Ice Modeling for Nearshore Beaufort and Chukchi Seas

Cost Range (in thousands): **Period of Performance**: FY 2003-2007

Description:

Background 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 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. 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 in the specific problem of modeling fine scale ice/ocean and ice/ice interactions. Recent research efforts outside of MMS are addressing the inclusion of a more sophisticated thermodynamic and ice thickness coupled to a dynamic sea ice model and ice-ice interactions on a one-to-few kilometer scale. Other research efforts have focused on the kinematics approach using discrete element models, which address individual floes. To increase the accuracy of addressing environmental questions about oil in ice two general steps need to be made. The resolution of ice models and ice data need 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. This study will improve ice-model resolution. The MMS will use the results of the sea ice modeling workshop to direct this sea ice modeling effort. Thus objectives, method, and cost estimate will be revised per workshop results.

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 model or one 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. Develop or supply existing ice model.

2. Produce stand-alone ice/ocean model or couple the ice model to the current MMS ocean model.
3. Run coupled model simulations.
4. 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 at the 1 to few km resolution of necessarily to resolve stakeholder concerns about oil spill trajectories in the nearshore Beaufort Sea. 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, is long-term study to advance the state-of-the-art, and 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 Beaufort Lease Sale and Development EIS's.

Revised Date: January 2001

Region: Alaska

Planning Areas: Beaufort Sea, Cook Inlet

Type: Competitive

Title: Persistence of Crude Oil Spills on Open Water

Cost Range (in thousands): **Period of Performance**: FY 2002

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 the 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 USDOI, 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 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 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 Beaufort Sea Development EIS's.

Revised Date: January 2001

Region: Alaska

Planning Areas: Beaufort Sea

Type: USGS, Biological Resource Division, or Competitive

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

Cost Range (in thousands): **Period of Performance:** FY 2002-2003

Description:

Background Native Alaskans living in Nuiqsut are concerned that arctic cisco, which they catch in the Colville River and use for subsistence, 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 impact 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 possibly, the cumulative effects of oil-related development. A study is needed to further establish the observed trends in arctic cisco abundance and determine factors influencing population variation.

Objectives

1. Form a partnership between Native subsistence users, knowledgeable fisheries biologists and relevant governmental organizations to take full advantage of scientific inquiry and traditional knowledge to address the issue of 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

1. Convene a workshop in Nuiqsut to gather traditional knowledge about arctic cisco abundance and fishing success, to identify factors that might contribute to observed variation in arctic cisco abundance and to recommend a study design for further scientific inquiry.

2. Quantify the abundance of fish of various cohorts in the Colville and its tributaries using sampling techniques such as fyke nets.

3. 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.

4. Review existing data from the MacKenzie River to see if gross changes in arctic cisco stocks have occurred.

Importance to MMS Information from this study will be used in support of environmental assessments for Arctic lease sales, post-sale mitigation, exploration plan reviews and EIS's supporting OCS developments. This study addresses concerns raised by Nuiqsut Natives during the recent Barrow Information Update Meeting.

Date Information Required: The study will provide information to support as yet unspecified future lease sales and oil and gas developments in the Beaufort Sea. Interim reports will be available to MMS following each field season.

Revised Date: January 2001

Region: Alaska

Planning Areas: Beaufort Sea

Type: Competitive

Title: Distribution and Abundance of Kelp and Associated Species in Western Camden Bay

Cost Range (in thousands): **Period of Performance:** FY 2002

Description:
Background The Alaska OCS Region conducted an Arctic Kelp Workshop during 1998 and participants made many recommendations for research. One recommendation concerned the sparse data on kelp communities outside Stefansson Sound. For example, in western Camden Bay, although patches of kelp were found near Flaxman Island, Konganevik Point, and the Warthog exploration site, the kelp community has not been studied in any detail. General surveys for kelp have not been undertaken in the rest of the western part of the bay.

Objective Determine the distribution and key characteristics of kelp patches in Western Camden Bay.

Methods The survey would extend from Flaxman Island eastward to Konganevik Point, and between the 5 and 50 meter isobaths. The survey would focus on large heads or clumps of kelp, determining their location, and estimating density, approximate age, and the diversity of associated organisms.
The kelp patches would be surveyed using vessel-based side-scan sonar with global positioning system, and follow-up visual surveys by remotely operated vehicle or diver. The side-scan sonar records would be analyzed with computer software like ISIS to determine the locations of large, old kelp heads.

Importance to MMS The study would provide information for agency review of future development plans and incorporation into any relevant environmental impact assessments. Data would be potentially useful for monitoring the effects of sedimentation from the Northstar and Liberty developments.

Date Information Required: Before 2005.

Revised Date: January 2001

Region: Alaska

Planning Areas: Beaufort Sea

Type: Joint Funding /Interagency

Title: Status of Salmon Populations along the Beaufort Sea Coastline

Cost Range (in thousands): **Period of Performance:** FY 2002-2005

Description:
Background "Pursuant to section 305(b)(2) of the Magnuson-Stevens Act, Federal agencies must consult with the National Marine Fisheries Service regarding any of their actions authorized, funded, or undertaken, or proposed to be authorized, funded, or undertaken that may adversely affect…." Essential Fish Habitat (50 CFR 600).

Essential Fish Habitat (EFH) for the five Alaskan salmon species (king, sockeye, coho, chum & humpbacked) is defined as:

1. "…all streams, lakes, ponds, wetlands, and other water bodies currently or historically accessible to salmon…"

2. "…all estuarine and marine areas utilized by Pacific salmon of Alaska origin, extending from the influences of tidewater and tidally submerged habitats to the limits of the U.S. EEZ."

Accordingly, the U.S. territorial waters of the Beaufort Sea and associated watersheds have been designated as EFH for Pacific salmon of Alaska origin. As a result, proposed oil and gas developments in the Beaufort OCS require consultation between MMS and NMFS over the effects of such developments on EFH.

Although salmon EFH has been designated, salmon are rare in the Beaufort Sea. During the summer, adult pink and chum salmon are present in the Colville River, and its tributaries, and caught in small subsistence fisheries by Native Alaskans living in the area. Previous studies have not demonstrated significant numbers of adults of other species. Immature life stages and successful spawning have not been found in the Beaufort Sea area. Additional information about the status of salmon populations along the Beaufort Sea Coastline is needed so analysts can prepare quality, project-specific, EFH consultations, as well as, the anticipated programmatic EFH consultation supporting the Alaska Region's next 5-year development plan. The budget for this study assumes 50 percent cost participation by other interested agencies.

Objectives

1. Locate and document the principle areas used by salmon near OCS developments in the Beaufort Sea.
2. Determine whether local streams or lakes are used for spawning by Alaskan salmon.
3. Determine whether local salmon populations are viable by documenting the presence of juvenile life stages in streams, lakes or along the coastline.

Methods This study has two phases, with the second phase being contingent upon recommendations resulting from analysis conducted in the first phase. In the first phase, the investigator will:

1. Conduct a literature review.
2. Assemble relevant traditional knowledge (TK) by reviewing existing archives and holding conversations with knowledgeable Natives. Prepare a synthesis report encompassing literature and TK.
3. Hold a workshop to review the synthesis document and determine whether research is needed. If research is needed, workshop participants would design a research project and recommend methodology to be used to conduct field investigations necessary to fill data gaps.
4. Prepare a report summarizing the advisory committee's recommendations for field research, if additional research is needed.

In phase two, the investigator will:

1. Conduct fieldwork, as recommended using methodology and study designs developed in phase one.
2. Prepare a report updating information about salmon in the Beaufort Sea.

Importance to MMS If viable populations of salmon are found in the Beaufort Sea area, this important information would allow MMS and NMFS to better focus EFH consultations on specific locations and issues. If not, dialogues might be expected to result in modification of EFH designations and future consultation requirements. Regardless, this information is necessary to enable analysts to prepare adequate project-specific and programmatic EFH consultations.

Date Information Required: Information is needed as soon as possible for input in EFH consultations for future, as yet unspecified, exploration and developments.

Revised Date: January 2001

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2002-2003

Region: Alaska

Planning Area: Beaufort

Type: Joint Funding

Title: Use of the Beaufort Sea by King Eiders

Cost Range (in thousands): **Period of Performance**: FY 2002-2004

Description:

Background Although the king eider population appeared to remain stable between 1953 and 1976, a recent analysis of migration counts off Point Barrow, Alaska determined 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 (July-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) will start oil production February 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 timing and distribution of spring and fall migrating king eiders in nearshore and offshore Beaufort Sea habitats.

2. Locate and describe staging, molting and wintering areas.

Methods This study is envisioned as a cooperative activity with key organizations potentially including: MMS, University of Alaska CMI, North Slope Borough, U.S. Fish and Wildlife Service, Canadian Wildlife Service, and U.S. Geological Survey- Biological Resources Division. The study will use multiple methods to determine habitat use patterns and locate the migration corridor for king eiders.

1. Visual counts of migrating birds will be made at Point Barrow. Spring and fall migration counts at Point Barrow have been conducted in 1953, 1970, 1976, 1987, 1994 and 1996. Although methods among all migration counts were not standardized, established techniques could provide additional and reliable population indices at this location.

2. Implanted satellite transmitters will be used extensively to monitor spring and fall migrations, document the potential use of the Beaufort Sea during molt and staging, and provide wintering information. Satellite transmitters would also allow the opportunity to document the rates of migration across Beaufort Sea.

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 impacts of offshore oil development are very 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: This study supports potential leasing and development needs for the Beaufort Sea Outer Continental Shelf.

Revised Date: January 2001

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2002-2003

Region: Alaska

Planning Areas: Beaufort Sea

Type: Competitive or interagency

Title: Modeling Patterns of Mortality for Avian Populations Exposed to Oil Spills in the Beaufort Sea.

Cost Range (in thousands): **Period of Performance:** FY 2002-2003

Description:

Background The success of recent cooperative efforts by the USFWS and MMS to predict the effects of oil spills on populations of Beaufort Sea waterfowl could be enhanced because current deterministic models are unable to accommodate the potential for waterbirds to aggregate in flocks, move as individuals or flocks, and otherwise, behave non-randomly with respect to the distribution of spilled oil. That approach tended to underestimate the variance of predicted mortalities from simulations. Moreover, in cases where birds tend to be concentrated in relatively large flocks, the deterministic model may yield radically different expectations of average numbers of individuals affected than would be predicted if the above factors were taken into account. A stochastic model is needed to predict waterbird mortality that is capable of incorporating the effects of changes in bird distributions, abundance, flock size, movement patterns and other factors that might lead to non-random distributions of birds relative to the distribution of spilled oil.

Objectives Develop a realistic model to be used to accurately predict the number of waterbirds of various species that are likely to be affected by oil spills in marine waters along the central coast of the Beaufort Sea .

Methods A stochastic computer simulation model will be developed that is capable of incorporating the effects of changes in bird distributions, abundance, flock size, movement patterns and other factors that might lead to non-random distributions of birds relative to the distribution of spilled oil. Species with highest priority for model development would be spectacled eider, oldsquaw, common eider, king eider, yellow-billed loon, brant, 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. The model will be designed to interface with MMS OSRA software and utilize data from past and recently completed waterfowl surveys. The model will be tested for sensitivity. A manual will be prepared outlining procedures necessary to input data and run simulations predicting waterbird losses under

various oil spill scenarios. A report will be prepared fully describing the model and its assumptions and summarizing the strengths and weaknesses of the stochastic approach employed.

Importance to MMS MMS analyses will benefit substantially from the addition of more accurate predictions of oil-spill-related 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, Liberty, and NPR-A.

Date Information Required: Analyses are required by early FY 2004 to support future MMS lease sales and EIS's.

Submitted by: Alaska OCS Region

Revised Date: January 2001

Region: Alaska

Planning Area: Cook Inlet

Type: Inter-agency or In-house

Title: Distribution and Abundance of Beluga Whales in Cook Inlet during Winter

Cost Range (in thousands): **Period of Performance:** FY 2002-2003

Description:

Background Noise from vessel traffic associated with oil development activities might potentially disturb and displace belugas from preferred habitat areas. Because the Cook Inlet population, currently estimated at less than 300 whales, has declined sharply over the past several years, the National Marine Fisheries Service (NMFS) has proposed listing this population as depleted and/or threatened. MMS in-house aerial surveys conducted in February-March 1997 suggest the area around Kalgin Island and East Forelands in upper Cook Inlet may be important habitat for this geographically isolated population during the late winter period. Comprehensive transect surveys across winter months are needed to confirm the importance of this area. Satellite transmitters will be used to monitor individual whales to augment survey data in determining the importance of upper Cook Inlet as winter habitat for the Cook Inlet population.

Objectives The primary goal of the study is to determine areas of Cook Inlet important to beluga whales during winter months. Specific objectives are to:

1. Determine relative abundance of beluga whales in various winter months by designing and implementing a protocol of repeatable aerial transects.

2. Determine whether relative abundance is correlated with ambient ice conditions, bathymetry, water temperature, currents, tides, fish runs, etc.

3. Monitor movements and habitat utilization by individual whales during winter.

Methods

1. Aerial surveys would be based out of Anchorage, Alaska. We anticipate the use of flights during optimal weather conditions to result in 10 surveys completed during November-December, 10 during January-February, and up to10 in late March. The sample design would consider dedicating a higher percentage of effort in survey blocks where beluga whales have been observed previously. The design must account for expected unfavorable survey conditions in parts of Cook

Inlet on any given day. Wider surveys of lower Cook Inlet, Kodiak, and Shelikof Strait during the winter would also be considered. Incidental sightings of other marine mammals would be recorded.

2. Up to 30 whales would be captured using standard techniques and instrumented with satellite transmitters attached to a nylon saddle and pinned through the skin and blubber to the dorsal ridge. Data will be obtained from ARGOS or other appropriate satellites and analyzed using GIS software.

3. A report will be written presenting the information collected.

Importance to MMS The study will provide information on the winter distribution and habitat use of beluga whales in the Cook Inlet-Gulf of Alaska OCS Planning Area for future oil-and-gas leasing, and potentially Section 7 Consultation with NMFS if the population is declared "threatened" under the Endangered Species Act. The beluga whale is currently an important subsistence species for indigenous people of Cook Inlet, especially those from Anchorage, Matanuska–Susitna, and Kenai boroughs.

Date Information Required: The information is needed to develop the next Cook Inlet Endangered Species Act Biological Evaluation and Draft EIS anticipated for the next 5-year plan.

Revised Date: January 2001

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2002-2003

Region: Alaska

Planning Areas: All Alaskan Planning Areas

Type: USGS Biological Resources Division or Inter-agency

Title: Alaska Marine Mammal Health and Contaminants Database

Cost Range (in thousands): **Period of Performance:** FY 2002 - 2003

Description:

Background The Alaska Marine Mammal Tissue Archival Project (AMMTAP) was funded by Minerals Management Service (MMS) in 1987 as part of National Oceanic and Atmospheric Administration's (NOAA) Outer Continental Shelf Environmental Assessment Program. Initial AMMTAP objectives were to develop methods for field sampling and long-term storage of frozen tissues (under optimal environmental conditions). This Alaskan study, now conducted for MMS by the US Geological Survey (USGS) Biological Resources Division (BRD), in cooperation with the NOAA Fisheries Office of Protected Resources (OPR) and the National Institute of Standards and Technology (NIST), became the model for nation-wide tissue archival. Analysis of tissue aliquots, a routine quality-control measure at AMMTAP, provides a wealth of information on contaminants but this information is not digitally available to management agencies and subsistence villagers making timely decisions about the safety of the environment and subsistence food. This contaminants database potentially could be linked with other data repositories to quickly access synoptic analytical data on marine mammal contaminants. Such repositories include those maintained by the Native Science Commission on Alaska subsistence species and the Alaska Frozen Tissue Collection (AFTC). Once established, this coordinated digital database would be readily accessible through AMMTAP, an ongoing tissue archival project. For example, the Native Science Commission has a database on contaminants for Alaska subsistence species that may be suitable.

Objectives The primary goal is to enhance the availability of published and unpublished contaminant data on Alaskan marine mammals for more immediate use by scientists and subsistence hunters.

Methods

1. Incorporate published and unpublished AMMTAP data into a web-linked relational database.

2. Incorporate and/or link to additional contaminant and histopathological data on Alaskan marine mammals.

3. Investigate the addition of spatial analysis and mapping features.

4. Create and demonstrate a menu-driven interface for management agencies and subsistence villagers in a searchable user-friendly format.

Where possible, all data sets will be compiled and converted to standardized formats. A multi-agency web site will be developed for the initial point of public access to the database and all partner agencies will maintain direct links to the site from their respective pages. Data could potentially be provided by State health agencies, Environmental Protection Agency, US Fish and Wildlife Service, and US Geological Service (USGS), Biological Resources Division. Histopathology data using the SNOMED system adapted by the USGS National Wildlife Health Center will also be made web-accessible.

Importance to MMS Questions about how oil-and-gas drilling and petroleum may potentially affect animal health, environmental contamination, and the safety of consuming subsistence species are of vital importance to many MMS constituents. The study provides accessible information on contaminant analyses directly to subsistence-hunting villages and other users.

Date Information Required: The information made accessible by this effort will be necessary to address concerns raised in the environmental impact statements for future coastal and offshore developments.

Revised Date: January 2001

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2002-2003

Region: Alaska

Planning Areas: Beaufort Sea and North Slope

Type: USGS, Biological Resource Division, or Competitive

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

Cost Range (in thousands): **Period of Performance:** FY 2002-2003

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 an earlier 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).

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. Beginning in 2000, however, industry will be conducting aerial polar bear surveys of coastal habitat over a series of years during the open water season until freeze-up in the Beaufort Sea. These surveys are required by stipulations set forth in the Northstar Environmental Impact Statement. The objective of these surveys is to provide general information regarding seasonal trends in the distribution and relative abundance of polar bears in terrestrial habitat.

Objectives: The purposes of this pilot 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. These objectives will complement information obtained from aerial surveys.

Methods Polar bears feeding on the remains of a hunter-harvested bowhead whale carcasses at Kaktovik and other locations along the Beaufort Sea coastline will be monitored. Observations will be conducted with binoculars and spotting scopes during daylight hours for up to 30 days to determine the exchange rates, sex/age composition, activity budgets, and behavior of bears at the feeding site. A report summarizing the findings will be prepared.

Importance to MMS: Oil and gas operations on the Coastal Plain of the Beaufort Sea are ongoing and expanding to offshore areas. Recent Environmental Impact Statements (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 in support of environmental assessments for Arctic lease sales, post-sale mitigation, exploration plan reviews and EIS's supporting OCS developments.

Revised Date: January 2001

Region: Alaska

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

Type: USGS Biological Resources Division or Competitive

Title: Predicting Polar Bear Denning Sites Using Topography, Wind Direction, and Wind Speed

Cost Range (in thousands) **Period of Performance:** FY 2002

Description:

Background Female polar bears (*Ursus maritimus*) occupy maternity dens that are frequently located on land on the North Slope of Alaska. The location of these land dens varies with local snow conditions. There has to be sufficient snow depth for the construction of a maternity den. The North Slope of the Arctic is classified as a desert based on the very low amount of annual moisture.

Objectives Create a model to predict the location of polar bear maternity dens based on snowfall, wind direction and speed, and other factors as needed.

Methods Collect information on past polar bear locations, weather information, and topography on the North Slope and incorporate the information into a ArcInfo-Arcview program. Use statistical methods to correlate den locations with topography, snowfall, wind speed and direction. Construct model to predict favorable local conditions (snow depth) during a given winter season. The model will include current weather conditions on snowfall, wind direction, and speed.

Importance to MMS During the environmental review of Sale 170, EIS, Liberty PDEIS, and NPRA EIS, Fish and Wildlife Service and the public expressed concern regarding the potential disturbance and displacement of denning polar bears on the North Slope that would be associated with cumulative oil and gas activities in the Arctic. Information on current denning habitat conditions along with den surveys in these areas will help to mitigate potential disturbance of denning bears during seismic exploration, ice road construction, and facility locations associated with onshore and offshore oil exploration and development on the North Slope and in the Beaufort Sea.

Date Information Required: There is a pressing need for information to mitigate disturbance of denning polar bears as required under the Marine Mammal Protection Act in the Letters of Authorization (LOA) permitting the lethal or nonlethal take of polar bears. Oil companies working on the North Slope and in the Beaufort Sea are required to have an LOA if their activities are expected to disturb or take polar bears. The Marine Mammal Protection Act requires mitigation of potential disturbance of denning bears. Future oil and gas activities on the OCS of the Beaufort and Chukchi Seas and support activities onshore

have the potential to disturb denning polar bears. This study will help to mitigate effects on denning polar bears.

Revised Date: January 2001

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2002-2003

Region: Alaska

Planning Areas: Beaufort Sea

Type: Joint Funding

Title: Polar Bear Population Monitoring Workshop

Cost Range (in thousands): **Period of Performance**: FY 2002

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 Environmental impact assessments for oil and gas operations require an assessment of the effect of the activities upon the resources identified. 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 would be enhanced by implementation of a suitable monitoring program. 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 support of environmental assessments for Arctic lease sales, post-sale mitigation, exploration plan reviews and EIS's supporting OCS developments.

Revised Date: January 2001

Region: Alaska

Planning Areas: All

Type: Joint Funding

Title: Joint Funding Opportunities in Existing Marine Bird Studies

Cost Range (in thousands): **Period of Performance:** FY 2002 and 2003

Description:

Background The MMS periodically learns from other federal agencies about short-term, lower cost (<$50K), partnership opportunities on existing marine bird studies initiated or underway by other agencies. Such proposal 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. Examples of opportunities to jointly fund projects are equipping endangered short-tailed albatrosses and threatened Steller's eiders with satellite transmitters to monitor their annual movements. These projects are relevant because small numbers of the albatross enter Alaskan coastal waters and small numbers of Steller's eiders breed on the western North Slope.

Objectives The purpose of this study is to establish a protocol whereby MMS may enter into joint funding arrangements with other agencies to facilitate the acquisition of needed small-scale information and/or data.

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), not to exceed the total funding proposed in the project.

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 profile. 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: No due date, but 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 the relevant planning area.

Submitted by: Alaska OCS Region

Revised Date: January 2001

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2002-2003

Region: Alaska

Planning Areas: Beaufort Sea,

Type: Competitive/Possible Cooperative Agreement

Title: Subsistence Mapping of Nuiqsut, Kaktovik and Barrow: Past and Present Comparison

Cost Range (in thousands): **Period of Performance:** FY 2002-2004

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 has done some detailed mapping of subsistence activities for these three North Slope settlements since 1990 but the mapping needs to be put in usable form. MMS assesses cumulative effects for NEPA documentation 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. Additional exploration is proposed at the McCovey prospect near Cross Island. 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. It is being constructed in 2000 and 2001. The Liberty development, the first on the Beaufort Sea OCS, is scheduled, if approved, to start construction in 2003. In general, exploration and development activities appear to have directly affected Nuiqsut the most, followed by Kaktovik and then Barrow. This study will use information from and build on (but not duplicate) the ongoing study "Reference Manual and GIS Overlays of Oil-Industry and Other Human Activity (1970-1995) in the Beaufort Sea." It will also coordinate with the documentation of subsistence activities at Cross Island which is part of the ongoing ANIMIDA study.

Objectives

1. Map the geographic pattern of use of subsistence hunters and fishers and possibly occurrence of subsistence resources.
2. Identify potential alterations in harvest use and seasons for all important species.
3. Assess relative nutritional and cultural importance of different species.

Methods

1. Consult with key organizations in refining the scope of work for the study and implementing the study. These organizations should include but are not limited to 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 Fairbanks.
2. Compile information on subsistence patterns from MMS and other studies for Nuiqsut, Kaktovik, and Barrow about 1990. Put into Geographic Information System form as needed. Include the unfinished GIS databases: the ADF&G Individual Harvest-Area Maps and Key Informant Mapping Project done for MMS. (The North Slope Village Subsistence and Socioeconomics panel at the NPR-A Symposium held by MMS and BLM in 1997 considered the computer-based (GIS) analysis of subsistence use one of the most direct and powerful tools available for making and predicting impact assessments. This approach allows a quantitative analysis of changes in hunting patterns over time.)
3. Compile current information on subsistence activities and consumption of subsistence species for Nuiqsut, Kaktovik and Barrow from recent subsistence scientific, private, and government sources. Gather traditional knowledge on current subsistence activities and consumption of subsistence species from selected, knowledgeable key informants of Nuiqsut, Kaktovik, and Barrow in scoping meetings or focus groups. Map where subsistence is currently taking place. Products will show potential:

--Reduced harvests
--Changes in access to resources
--Increased competition for resources
--Increased costs
--Increased effort
--Increased risk

4. For each subsistence activity map, establish metadata descriptive authentication, identifying source of primary data, including traditional knowledge and/or scientific sources.
5. Illustrate on maps changes in oil and gas infrastructure onshore and offshore infrastructure for 1990, a mid-point year, and the most current year. Show in map form exploration activity, including seismic exploration and drilling by year since 1990 to the present.
6. Put all spatial information on subsistence and industry activity in a Geographic Information System.
7. Compare 1990 subsistence activities with the present with respect to oil and gas activities and determine the cumulative effects. Review and evaluate effectiveness of current federal and state mitigation associated with oil and gas activity on displacement of subsistence resources and hunters and fishers. Analyze and integrate other related descriptive information.
8. Review comparison and analysis with key informants and key organizations including but not limited to identified in 1 above. Disseminate ongoing and final products of study to local residents through village workshops and integrate workshop feedback into the study.
9. Make information available on CD-ROM.

Importance to MMS MMS will use the comparative time series information to assess cumulative sociocultural effects for NEPA documentation for lease sales and development projects in the Beaufort OCS. Also, MMS, in cooperation with the North Slope Borough and other management agencies, can use the information on specific subsistence areas to advise the oil and gas industry on planning of their activities as not to disturb wildlife habitat and respect the Native culture.

Date Information Required: The information is needed for NEPA documentation for: exploration and possible development at the McCovey prospect, monitoring at Liberty and Northstar, and probable Beaufort Sea lease sales in the "OCS Oil and Gas Leasing Program 2002-2007."

Revised Date: January 2001

Region: Alaska

Planning Areas: Beaufort and Chukchi Seas and Hope Basin

Type: Competitive

Title: North Slope Borough Economy, 1975 to Present

Cost Range (in thousands): **Period of Performance:** FY 2002

Description:

Background The focus of the social and economic studies of the Alaska OCS Region of the MMS 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 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 2000. In 2000 projections for demand for natural gas in the Lower 48 States is anticipated to be sufficient to warrant such production. This could increase the NSB revenues.

Objectives

1. Describe revenues and expenditures of the North Slope Borough, 1975 to the most current year available.

2. Portray how the North Slope Borough, 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, 1975 to the most current year available.

4. 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 North Slope Borough revenues and expenditures for each year from 1975 through the most current year available for capital projects. The capital improvement program (CIP) for each year will group projects by categories, such as education, roads, housing, airports, light, power and heating systems, public safety facilities, sanitary facilities, and so forth. Classify local government services by departments of the NSB and other major categories.

2. Using the institutional profile analysis method focusing on key informants, determine how the NSB, as the local government, anticipates responding to a decline in revenue.

3. Also using key informants, determine 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.

4. Using data from the NSB and State Department of Labor, describe the structure of the NSB economy and changes, 1975 to the most current year; i.e., employment by sector of the economy and employer.

5. Coordinate entire study with NSB officials.

Importance to MMS This study will be useful to MMS in assessing potential economic impacts of OCS development activity on the NSB a 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 the 2003-2008 Five Year Program EIS, post-lease environmental assessment of Beaufort Lease Sale 176, and probable lease sales in the Oil and Gas Leasing Program 2003 to 2008.

Revised Date: January 2001

Region: Alaska

Planning Areas: Beaufort Sea

Type: Competitive

Title: Beaufort Sea and North Slope Pipeline GIS Database

Cost Range (in thousands): **Period of Performance:** FY 2002-2004

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 Outer Continental Shelf (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 (TAP) spillage. This objective required concomitant pipeline segment throughput and pipeline segment length information at yearly or better intervals. The prior study found that information on when individual pipeline segments were constructed was not compiled and available from industry or other sources. 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 TAP 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 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: Information from this study will be used by Alaska OCS Region staff in preparing future development EIS's, lease sale EIS's under the next 5-year schedule, and in reviewing oil-spill-contingency plans.

Revised Date: January 2001

Region: Alaska

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

Type: Competitive

Title: Worst-Case Blowout Occurrence Estimators for the Alaska OCS

Cost Range (in thousands): **Period of Performance:** FY 2002-2003

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. 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 know a worst case, catastrophic case, large-spill case, 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 (TAR) 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. The study would be coordinated with the TAR Program.

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 regional (Alaska) oil spill contingency plans and environmental assessments.

2. Evaluate applicability of alternate approaches against data needs and availability for each approach. Give consideration to:
    - Geological formation constraints.
    - Environmental and geological hazards specific to individual planning areas and more local hazards that may effect size or likelihood of blowouts.

- How engineering design may affect 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.

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 by Alaska OCS Region staff in preparing future development EIS's, lease sale EIS's under the next 5-year schedule, and in reviewing oil-spill-contingency plans.

Revised Date: January 2001

Region: Alaska
Planning Areas: Beaufort Sea, Chukchi Sea, and Hope Basin

Type: Joint Funding/Inter-agency

Title: Investigation of Sea Level and Climate Change in Arctic Alaska for the Past 20,000 Years

Cost Range (in thousands): **Period of Performance:** FY 2002-2003

Description:
Background The history of past sea level stands during the past 20,000 years is complicated and inadequately understood in Arctic Alaska. Sea level has fluctuated from approximately 10 feet above to over 250 feet below its current level. Primarily, data from sea level investigations done by USGS in the Bering Sea Region during the mid-1960's is still the standard used in all Arctic and subarctic Alaskan areas today. Recent academic research funded by NSF and other national and international research organizations in Alaska and Siberia has shown that climate change and sea level are directly related and are much more temporally and spatially complex than previously thought. Because of this , general sea level curves for the Bering Sea Region constructed decades ago do not accurately reflect some sea level events in the Chukchi and Beaufort Seas.

Other national and international research programs and initiatives such as results from PARCS (Paleoenvironmental Arctic Sciences—Arctic Paleosciences in the context of Global Change), IMAGES (International Marine Global Change Study), PALE (Paleoclimate from Arctic Lakes and Estuaries), and studies from the International Arctic Research Center (IARC) may provide partnerships for funding and research collaboration. The budget figures above represent the MMS portion, which is 50 percent of the total cost of the study.

Objectives The objective is to coordinate an integrated program of onshore and nearshore landform mapping, and organic sample collection for age-dating along the northern Alaska coast to establish a higher resolution climate and sea level history for the past 20,000 years. This sea level history will help establish an up-to-date sea level curve that will serve as the basis for a much-needed new archaeological baseline study for the Arctic and Bering Sea OCS planning areas. In addition a high frequency sea level history will assist in the assessment of environmental changes, establishing whether they are naturally occurring or anthropogenically driven.

Methods

1. Thorough review of existing studies and onshore topographic maps, aerial photographs, and satellite imagery, and offshore bathymetric maps for delineation of landforms possibly created or modified by smaller order higher and lower past sea level stands on the decennial and millennium scale.
2. Compilation of data and mapping of landforms.
3. Review of relevant current and past micropaleontological and archaeological investigations.
4. Review existing data and select sites and areas for field investigations.
5. Conduct field investigations of onshore landform mapping, organic sample collection for age-dating, and documentation. Work from base camps along selected coastal locations, supported by helicopter and small watercraft.
6. Conduct concurrent nearshore fathometer transects for mapping bathymetry and seafloor sampling for micropaleontological, and sediment data using a small boat.
7. Compile field research and laboratory analysis. Integrate field data with data from existing maps and investigations including "Evaluation of Sub-Sea Physical Environmental Data for the Beaufort Sea OCS and Incorporation into a Geographic Information System (GIS) Database" (#AK 99-02).
8. Establish a new sea level database for the Regional archaeological baseline study.

Importance to MMS

1. Establishing a new and accurate sea level history is important for protection of archaeological resources by better understanding where people may have migrated, hunted, and established camps and settlements. Understanding and resolving higher frequency sea level fluctuations is critical to understanding the wider swings of rising and falling sea level that have affected the OCS.

2. Understanding the age, origin, morphology, dynamics, and stability of paleo-features and the ecological consequences of past sea level stands is useful in assessing subsea pipeline routes and areas of pipeline landfalls. It is also useful for monitoring short-term and medium-term environmental effects on and of pipelines such as those proposed for offshore Beaufort Sea North Star and Liberty production areas.

3. This study will add information to sea level history and paleo-landform aspects of Study #AK 99-02

4. Enhancing resolution of Arctic sea level changes is pertinent to the general study of climate change and essential to the increasingly focused study of Polar climate change. This will be useful in determining whether changes in the nearshore and shoreline environments are the result of naturally occurring cyclic events or are due to changes in human activities such as offshore oil and gas in the Arctic.

Date Information Required: FY 2003 for NEPA documentation for lease sales anticipated in the forthcoming Oil and Gas Leasing Program 2003 to 2008.

Revised Date: January 2001

Region: Alaska

Planning Area: Cook Inlet

Type: Joint Funding/Inter-agency

Title: Cook Inlet Research Project Tracking System

Costs Range (in thousands): **Period of Performance:** FY 2002

Description:

Background Most of the common problems facing the public, researchers, and managers in Kachemak Bay and all of Cook Inlet is the poor understanding of the research needs, and the public understanding what agencies are doing. MMS could cooperatively support the development of a sustainable tracking system to identify and track research, monitoring, and agency management/planning activities for Cook Inlet and its watershed. This project would coordinate very well with the Cook Inlet Information Management and Monitoring System (CIIMMS) and other organizations such as the Kachemak Bay National Estuarine Research Reserve (KBNERR). CIIMMS is coordinating efforts with other agencies as a single web-based source of information for Cook Inlet. The *Exxon Valdez* Trustee Council is supporting this effort. Several organizations are contributing to CIIMMS

Objectives The goal of this study is to develop a computer web-based tracking system that will receive information from government agencies and organizations studying Cook Inlet and its watershed. The system will be installed on a single site that is accessible to the public and researchers. The system will accept information from all users and compile the project information into a database. The database will be searchable by all agencies, organizations and the public.

Methods

1. Develop a database structure that can capture project specific information on agency and other organizations' activities.

2. Compile the information into a user- friendly database and interface for all constituents to access.

3. Develop a web-based search-engine for the project database.

Importance to MMS A successful system to track the ongoing research in Cook Inlet and its watershed will allow MMS to focus its limited funding by acquiring only needed data, and working cooperatively with other agencies and organizations.

Date Information Required: Coordinate with the development of CIIMMS and the KBNERR project databases currently being developed for the purpose of studying the Cook Inlet and its watershed. The project funding will be needed by FY 2001.

Revised Date: January 2001

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2002-2003

Region: Alaska

Planning Areas: All Alaska Planning Areas

Type: Contract

Title: Conference Management and Reports on MMS Results

Cost Range (in thousands): **Period of Performance:** FY 2001-2005

Description:

Background As discussed in Section 1 Introduction-Background of this ASP, the Alaska 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 (ITMs) 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.

Objectives The objectives are to produce ITM's, small workshops, and publications on OCS environmental studies information. We will plan and fund the ninth Alaska ITM during FY 2002, the tenth in FY 2004, and the eleventh in FY 2006. We anticipate the need for small workshops in FY 2003 and FY 2005. .

Methods The primary method is to provide for the logistical coordination of the meetings, and to help with preparation of publications.

Importance to MMS Continuation of 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. Further development of OCS prospects is anticipated during the next few years. With development industry-sponsored research probably will provide an increasing portion of the environmental assessment information. This also will increase the need for information transfer and exchange.

Date Information Required: There is an ongoing need for the transfer of studies information, so ITM's or small workshops will be convened as needed, and the dates will be coordinated with lease sales and industry operations.

Revised Date: January 2001

Contributing Authors and Support Staff

Stan Ashmore, Geographer
Michael Burwell, Socioeconomic Specialist
Cleve Cowles, Chief, Environmental Studies Section
Don Hansen, Wildlife Biologist
Tim Holder, Socioeconomic Specialist, Coordinator for Annual Studies Plan
Warren Horowitz, Oceanographer
Joel Hubbard, Wildlife Biologist
Ida Menge DeBock, GIS Technician
Charles Monnett, Marine Ecologist
Richard Newman, Oceanographer
Dick Prentki, Oceanographer
Caryn Smith, Oceanographer
Geraldine Taylor, Secretary
Dennis Thurston, Geophysicist
Steve Treacy, Senior Wildlife Biologist