

MMS Environmental Studies Program

FY 2001 Prospectus

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Herndon, VA**

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¾ MMS ESP Research Mandate ¾

Establish information needed for assessment and management of environmental impacts on the human, marine, and coastal environments of the OCS and potentially affected coastal areas.

(Outer Continental Shelf Lands Act, Section 20)

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Introduction

As stewards of our Federal offshore lands known as the Outer Continental Shelf (OCS), the U.S. Department of the Interior's Minerals Management Service (MMS) is responsible for balancing the Nation's exploration, development, and production of petroleum energy resources and other marine minerals with the protection of the human, marine, and coastal environments.

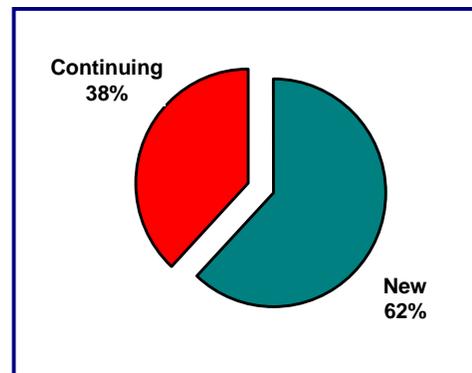
MMS regulates exploration, development, and production activities on about 8,000 active leases including 4,000 production facilities to ensure that these activities are conducted safely and in an environmentally sound manner.

The MMS's environmental programs serve this important function by providing solid scientific information needed for critical program decisions that must, by law, accommodate this delicate balance. The commitment to environmental protection begins with the first steps in the leasing process and continues through to the end of the production activity with decommissioning/removal of the production structure. In support of this commitment, the MMS places a high priority on environmental and socioeconomic research and allocates approximately \$19 million annually to these efforts. This Fiscal Year (FY) 2001 Prospectus was prepared by the MMS Environmental Studies Program (ESP) to briefly describe new projects that will be undertaken this year.

ESP Overview

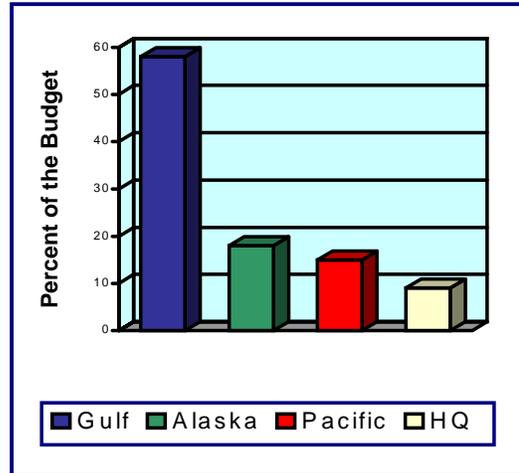
In FY 2001, approximately 62 percent of the ESP budget will be available to start new projects. The 22 new projects being designed involve a diverse range of activities including workshops, field studies, and modeling efforts. Looking only at the funds allocated to new procurements, approximately 75 percent will be awarded competitively, 20 percent through interagency agreements, and the remainder through cooperative agreements and noncompetitive awards and in-house studies.

The MMS will continue to rely on Regional Coastal Marine Institutes (CMI's) to address requirements for new information being developed. The CMI budget represents 20 percent of the overall ESP budget.



More than one-half of the ESP budget will be devoted to new projects in FY 2001

The Gulf of Mexico Region will continue to be the primary focus for research, with over 58 percent of the budget allocated to scientific research and information synthesis in the central, western, and eastern Gulf. The Alaska and Pacific Regions' studies will account for almost the same level as previous years (18% of the budget in Alaska and 15% of the budget in the Pacific).



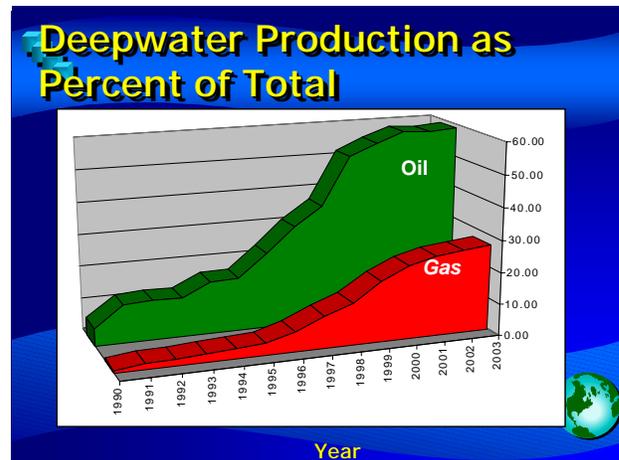
The GOM will continue to be the primary focus for ESP research in FY 2001

Addressing OCS OCS Information Needs

Gulf of Mexico Region

The eastern Gulf of Mexico (GOM) remains an area of untapped potential. With projected reserves of 5 trillion cubic feet of natural gas, it is the second largest field in the GOM. With a proposed focused lease sale coming up in 2001 in the eastern Gulf, there is tremendous industry interest to test the theory that some of the plays in the central Gulf may extend further eastward. A major study initiative this year will be an integrated study of physical and biological processes. This effort will contribute to the oceanographic information database for this area and provide information for management decisions and future lease sales.

Since 1996, the deepwater Gulf of Mexico OCS ($\geq 1,000$ -foot water depth) has experienced a substantial increase in leasing, exploration, development, and production activities. The remote location, harsh operating environment, new and unusual technologies, different operating procedures, and additional environmental issues present regulatory and environmental concerns. Additional information on deepwater-related issues will enhance MMS environmental analyses and assist in developing new and refining current mitigation.



GOM deepwater areas will play an increasing role in overall OCS oil and gas production in the future

Alaska Region

In Alaska, MMS is focusing on the Northstar and Liberty development plans in the Beaufort Sea. The MMS recently approved the Federal portion of the joint State/Federal Northstar project. This project provides for directionally drilling up to seven wells from the Northstar Island unit into two OCS leases in Federal waters. This project will be the first approved plan to use a subsea pipeline in Alaska. Production is scheduled to begin late in 2001.

To support the required National Environmental Policy Act (NEPA) analyses for these projects, the ESP initiated a new suite of studies in the Beaufort Sea in 1999. These studies embrace interdisciplinary efforts that include biological, chemical, and physical oceanographic components designed to measure sublethal effects caused by offshore activities and to improve oil-spill risk analyses. Alaskan studies will continue melding traditional knowledge with western science. The focus will continue to be the Beaufort Sea area, but we will also include collecting information in the Cook Inlet area to support NEPA analysis for potential future leasing activity in that area.

Pacific Region

There are 36 undeveloped leases in the Southern California Planning Area. These may see exploration and/or development activity during the next decade, resulting in as many as four additional OCS platforms. Decommissioning activities will also be an increasingly important part of the Pacific Region's focus relative to offshore platforms, associated pipelines, and onshore facilities.

Studies will continue to monitor impacts associated with ongoing production activities. Particular emphasis will be placed on monitoring the general health of intertidal communities and on monitoring regulatory compliance at specific platforms. A major emphasis in the Pacific Region will be the continued collection of physical oceanographic field data that are needed for environmental assessments and review of oil-spill contingency plans.

Headquarters

The Headquarters offices, taken together, address national OCS oil and gas issues and marine minerals issues.

In the offshore oil and gas arena, updates to the air quality models currently in use for the OCS have not kept pace with advancements in onshore models. It is important that MMS use a model that incorporates current knowledge concerning over-water atmospheric boundary layer structure and dispersion to apply to OCS emission sources. A new study will adapt one of the Environmental Protection Agency's advanced models for use on the OCS to enhance MMS air quality impact analyses in lease sale environmental impact statements (EIS's). Additionally, oceanographic field and modeling studies will investigate the bottom boundary layer flow, and an effort will begin to evaluate the current state of environmental impact assessment models.

Marine mineral issues are best exemplified by the occurrences of severe storms along the U.S. East and Gulf Coasts, which have resulted in severe beach erosion with unprecedented levels of economic losses. High storm waters have carried away vast amounts of beach sand and have breached dune systems that protect the coastal areas and provide a source of revenue for many beach communities. Many of these areas will require extensive nourishment in the near term to offset this damage and to prevent further damage in the event of future storms. Several ongoing studies and two new studies will address the environmental implications of using submerged shoals located on the Federal OCS as long-term sand borrow areas and as a source of sand for routine periodic beach renourishment.

New Research Projects

Gulf of Mexico Region



Northeastern Gulf Integrated Study of Physical and Biological Processes

The northeastern GOM continental shelf is an ecologically heterogeneous marine ecosystem. The health of the shelf ecosystem depends on physical habitat, environmental and climatic factors, nutrient availability, and oceanographic processes. These physical processes link the biotic components of the ecosystem. A number of data gaps that need investigating include primary and secondary production levels, taxonomic and trophic structure of coastal and shelf communities, coupling between water column and benthic communities, impacts of freshwater on shelf ecosystems, impacts of catastrophic events, and status and trends in fisheries resources and management. There is little information on the relationship between current movements and larval recruitment.

This project will identify and increase the qualitative and quantitative understanding of currents and circulation patterns which help establish links and redistribute primary and secondary productivity within the ecosystem. It will also lead to a better understanding of the nutrient and sediment distribution and larval dispersal. This study will also address the impacts of extreme or occasional events such as eddy intrusions, upwelling, floods, and hurricanes on the ecosystem. Finally, these data will address the fluxes and movement of sediments in the bottom boundary layer and their impacts on the benthic fauna.

The study will establish a pattern of moorings to study water column and near-bottom currents and examine near-bottom sediment transport using specially designed current meter systems at several shelf sites. The study will be coordinated with other Federal ongoing projects such as the National Marine Fisheries Service (NMFS) Marine Recreational Fisheries Statistics Survey, data collected by the fisheries observer programs, SEAMAP, and other ichthyoplankton collections. Larval transport will be studied using surface drifters and results from numerical models.

Information derived from this study will be used in production of required NEPA documents. The project will be the climax of the Northeastern Gulf of Mexico Physical Oceanography and the Northeastern Gulf of Mexico Coastal and Marine Ecosystem Programs and will provide information for future management decisions.

Deepwater Program: Exploratory Current Study in the Slope and Rise

Initial observations of GOM deepwater currents by an MMS study in the mid 1980's revealed weak to moderate currents driven by Topographic Rossby Waves. Recent data in the northern Gulf have shown that strong currents having speeds of 1-2 knots (50-100 cm/s), periods of 10-15 days, and apparently short spatial scales occur. The processes responsible for causing such strong flows are not known. The same data reveal that the Loop Current and its eddies are very active in the deep Gulf. More information is needed concerning the currents near the Mississippi Canyon where newly separated eddies begin their westward voyage across the deep Gulf.

The objective of this effort is to conduct an exploratory study of currents over the entire water column with limited spatial coverage in GOM deepwater areas:

- to identify temporal and spatial scales of motion;
- to evaluate the physical processes detected in terms of energy content and frequency; and

- to design and evaluate a mooring array and hydrographic survey for a comprehensive study of currents in deepwater of the Gulf of Mexico.

This effort will deploy mooring arrays with optimized number and locations and will conduct four oceanographic cruises over one and one-half years in GOM deep waters (200-3000 m). Remote sensing data will also be employed to examine the synoptic thermal and sea surface topography of the area. Detailed surveys of important features will be conducted to investigate their characteristics.

The results will be available for completing risk assessments used by MMS for preparation of NEPA documents, and for use in understanding sediment transport and recently discovered erosional mega-furrows, and larval dispersal of biologically sensitive communities such as chemosynthetic communities.

A Study of the Effectiveness of Airgun Array Ramp-up in Reducing Potential Noise-Related Impacts to Cetaceans

The potential effects of noise, particularly low-frequency, on marine mammals is a topic of controversy. Concern has been raised that hearing damage could occur to a nearby marine mammal if an airgun array were turned on suddenly. Ramp-up has become a standard mitigation procedure for seismic operations in many areas of the world. The procedure involves a gradual increase in source intensity from some basal level to full operating strength over a period of several minutes. It has been assumed that marine mammals will find the sound aversive and move away before hearing damage occurs; however, there have been no comprehensive studies to examine the effectiveness of this procedure.

This study is intended to test the effectiveness of ramp-up to induce marine mammals to vacate areas near the array (e.g., within the 180-dB zone) where they are believed to be at risk of temporary or permanent hearing damage. This field study will focus on the endangered sperm whale and some other cetacean species that have frequent occurrence in the northern GOM.

During the 1999 MMS Marine Protected Species Workshop (held in New Orleans, Louisiana), workshop participants strongly recommended that the behavioral response of the endangered sperm whale and other cetaceans to seismic surveys be studied. Lack of information on the efficacy of ramp-up as a mitigation measure may result in the imposition of additional expensive and, in some circumstances, unnecessary mitigation as requirements for future seismic surveys. Validation of ramp-up as mitigation could allay some concern over the potential impacts of seismic surveys on marine mammals. In addition, it could reduce reliance on other, more expensive, mitigation measures.

OCS-Related Use of Navigation Channels

Use of navigational channels by OCS oil and gas activities generates a variety of impacts upon the coastal, social, and economic systems. The last study of OCS-related use of navigational channels occurred during the mid 1980's, and its data are outdated. Lease sale EIS's rely significantly upon this now outdated information.

In addition, information from the MMS Port Fourchon study will be better understood within the broader context of channel use around the Gulf.

The objectives of this study are to:

- document present traffic density on navigation channels around the Gulf;
- compare OCS-related traffic densities with documented overall traffic density on navigational channels around the Gulf;
- document the evolving, historical, OCS-related use of coastal navigation channels around the Gulf;
- project foreseeable future general and OCS use of navigational channels; and
- use these projections to identify and discuss related socioeconomic and environmental changes (impacts) that may result from navigational patterns and channel use by both the OCS Program and general shipping.

This study will provide insights into existing and changing patterns of port and channel use around the Gulf. This knowledge is an important platform from which environmental and socioeconomic impacts of OCS-related navigational traffic can be identified and discussed. These issues have become important sections in OCS-related NEPA documents. Once identified and described in OCS-related NEPA documents, these insights alert MMS managers and State and local agencies about pending or developing problems, such as increasing or declining channel and port use, as seen at Port Fourchon and Delacroix, Louisiana.

Deepwater Program: An Analysis of Transportation Logistics of Offshore Oil Exploration in the Gulf of Mexico, Phase I: Port Fourchon Case Study

Ports and port-associated support facilities provide critical staging areas for OCS oil- and gas-related activities. This supply network has expanded greatly in size, complexity, and sophistication since the installation of the first offshore platform in 18 feet of water off the Louisiana coast in 1947. As indicated by recent MMS-funded research on Port Fourchon, the expansion of the offshore industry into deep water has imposed new challenges on the existing logistical system. Ports must be understood as a physical infrastructure, as intermodal foci of transportation networks, and as institutions operating in the context of fluctuating industry demand, consolidation of functions, and competition for business, services, and development funds. The scale and scope of port-centered, OCS-related logistics and transportation activities are not well documented nor understood.

On the U.S. Outer Continental Shelf, there are over 55,000 workers, 4,000 oil and gas production facilities, and 21,000 miles of pipeline.

This proposed study will provide more detailed input/output and sector information than currently exists. By following transportation links from suppliers to the platforms, it will

develop better ways to localize the onshore effects of offshore activities. By analyzing port activities, it will develop ways to calibrate port capacity for the MMS Geographical Information System (GIS).

The objective of this research is to analyze the transportation logistics support system of the GOM oil and gas industry. Project objectives include:

- analyze, in detail, operations at Port Fourchon;
- define technological procedures of a port providing services to offshore industry;
- analyze the transportation network supporting the system from inland destinations to the ports, and the modes of transport offshore;
- analyze interrelationships among various economic sectors and the oil and gas industry based on transport volumes and activities; and,
- delineate major supply and demand relationships relating to transportation demand and offshore output.

The MMS is required by NEPA to document onshore effects of the OCS program. An understanding of ports is important to MMS for many reasons:

- the institutional aspects of ports affect schools, local businesses, and employment. (Effects occur on community income, wages and employment, income distribution, labor demand, and the like.);
- the analysis of transportation can provide insight into the backward linkages of the offshore industry (from the platform to the suppliers), hence, insight into the spatial distribution of direct and indirect economic effects of the oil and gas industry and into the interrelationships among various economic sectors;
- the measurement of transportation can provide insights into relationships between industry activity and industry demand for various goods and services; and
- the measurement of transportation activities at Port Fourchon will be the first step towards monitoring deepwater-driven port activity there and at other key ports.

This information will be used in EIS and decisionmaking documents as soon as it becomes available.

Chemical and Oil Impact Assessment Model for NEPA Analysis of Spills

The MMS has considerable experience managing OCS oil and gas resources. This experience and the largely traditional operational approaches undertaken by industry on the shelf have made it possible for MMS to efficiently fulfill its regulatory mandates. During lease sales and other Federal actions (e.g., permitting etc.) the MMS is responsible for conducting a NEPA review of proposed actions, potential impacts, and alternatives. Part of this responsibility includes evaluating the potential risks to the environment from the most probable spill events associated with these Federal actions. This process usually involves several interrelated steps including designation of potential targets, incorporation of the latest physical oceanography, incorporation of weathering information, trajectory modeling, and evaluation of probability of contact with sensitive biological resources. Staff biologists go on to further evaluate the potential impacts to sensitive biological resources from contact with the oil or chemical spill. These impacts to biological resources are evaluated in semi-quantitative terms using available data and best professional judgement. This is due to several factors including lack of data, lack of a satisfactory model to evaluate dose response relationships in a real world scenario, lack of long-term (>5 days) coupled physical-chemical trajectory models, and insufficient incorporation of a measure of statistical uncertainty.

The purpose of this effort is to purchase an “off-the shelf” user-friendly scientifically defensible trajectory, fates, and biological impact chemical and oil-spill model capable of being run in a Microsoft Windows operating system that will provide output for water quality specialists and biologists responsible for NEPA analyses.

This modeling tool will help focus the analyses of various biological resource specialists. It will provide an analytical tool that biologists could use to assist in the delineation of impacts to sensitive resources. It will provide estimates of impacts that are statistically defensible and based on the best available oceanographic and biological data. This will improve future NEPA analyses by focusing the discussion of effects to those resources that may be most impacted by oil or chemical spills.

A Survey of the Relationship of the Australian Spotted Jellyfish, *Phyllorhiza punctata*, and OCS Platforms

The Australian spotted jellyfish, *Phyllorhiza punctata*, was seen in tremendous concentrations in the Gulf of Mexico during the late summer of 2000 as was another invasive jelly, *Drymonema dalmatina*. Both of these invasive species appear to have come into the Gulf from Caribbean waters. The jellyfish concentrations were in prime locations to feed on the planktonic larvae and eggs of shrimp, crabs and many important fish species that spawn offshore as they drifted on the currents to inshore nursery areas of the Mississippi Sound. The coincidence of high jellyfish concentrations in such locations with the breeding seasons of many commercially important fisheries species could have an impact on next year’s recruits. It has been speculated that should this situation occur in successive years, commercially important fisheries could be affected in the long-term as well. The adult medusae produce larvae that attach to hard substrate and become hydra-like polyps during the winter. Jellyfish, and other attaching organisms, use oil and gas platform structures, artificial reefs, and natural hard bottoms as suitable substrates for attachment.

This study will investigate the potential role that offshore platforms play during the polyp stage of the jellyfish life cycle, with emphasis on the Australian spotted jellyfish, *Phyllorhiza punctata*. The specific objectives of this study are:

- to determine the areal extent of the sessile polyp stage of the jellyfish; and
- to determine the proportions of Australian spotted jellyfish recruits with respect to other jellyfish species and other attached organisms on offshore platforms, other hard substrates and the bottom of the Gulf.

In the spring of 2001, plankton net tows will be conducted at selected locations to collect the ephyra stage of the jellyfish. Certain platforms, artificial and natural reefs will be chosen based on the highest ephyra densities. At these structures, settlement plates will be placed in the late summer or early fall. After the larvae settle and develop into polyps, these plates will be collected and examined to determine jellyfish densities.

The SO₂ and NO₂ Increment Analysis for the Breton National Wilderness Area

The Clean Air Act strictly limits how sulfur dioxide (SO₂) and nitrogen dioxide (NO₂) concentrations may increase over the Breton National Wilderness Areas (BNWA); however, there is no present information that demonstrates whether that area is in compliance with the mandated limits. If OCS activities are to continue near the BNWA, the increment analysis is needed to determine the degree of increment consumption and to determine the amount of air quality degradation at the BNWA.

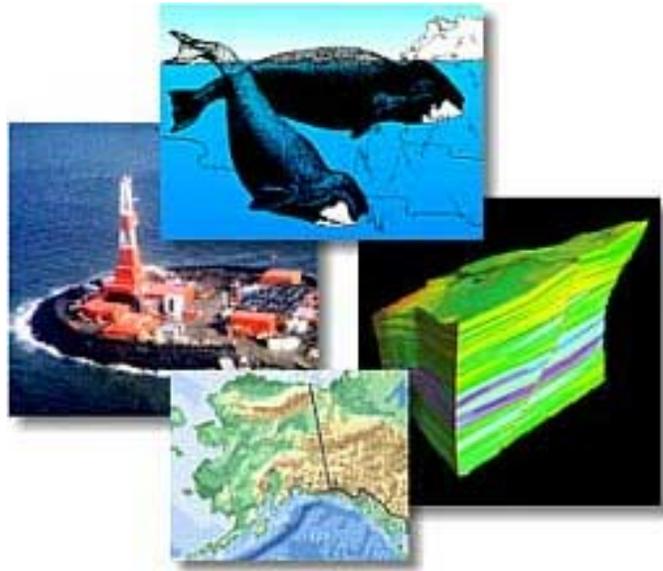
The objectives of this study are:

- to synthesize data and analyses for a brief pollutant climatology on SO₂ and NO₂ concentrations over the BNWA,
- to develop emission inventories for sulfur oxide and nitrogen oxide sources,
- to select an air pollution model based on representative simulation of present concentrations, and
- to simulate SO₂ and NO₂ concentrations over the BNWA for 1977 (SO₂) and 1988 (NO₂), and
- to determine their respective increments.

This project was approved in FY 2000 and will be awarded in FY 2001.

New Research Projects

Alaska Region



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

This study addresses important differences between scientific results and traditional knowledge on bowhead responses to oil-industry noise, especially the mesoscale responses of individual whales that are deflected by active seismic vessels. It will directly measure received sound levels and distances from oil-industry activities at which the behavior and physiology of individual whales become affected, thus making them harder to hunt; course deflections begin to occur; and whales return to their normal migration after passing industrial activities. Study information will also address other concerns on where and how long migrating whales stop to feed, whether some whales migrate farther north than reported, and where fall whales go after migrating past Barrow, Alaska. This study will be conducted in cooperation with other concerned entities such as the Alaska Eskimo Whaling Commission (AEWC), the North Slope Borough (NSB), NMFS, and the oil and seismic industry.

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

- 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;
- determine actual received sound levels and distances from industry noise at which tracked whales divert and/or their physiological patterns are altered;
- observe/detect startle effects when seismic airguns are turned on and any cumulative effects of repeated exposures to oil-and-gas-industry noise; and
- analyze ancillary data on the time spent by tracked whales in various geographic areas and correlate with any available observations of whale feeding.

The information will be needed for postlease exploration plans in the Beaufort Sea, postlease activities supporting development and production plans (DPP's) at Northstar and Liberty, as well as future DPP's and EIS's. Results of the study will be used to 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".

Analysis of Covariance of Human Activities and Sea Ice in Relation to Fall Migrations of Bowhead Whales

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.

The goal of this study 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:

- 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; and
- develop appropriate measures of sea ice for covariant analysis with whale distribution data.

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.

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). The study addresses long-standing concerns about oil-industry activity raised by subsistence whale hunters. It also addresses site-specific information needs expressed by oil-industry representatives at previous government workshops on developing site-specific monitoring guidelines. Study information is needed for the Liberty Development and Production Plan EIS and for postlease permit approvals for all Beaufort Sea sales (Sales BF, 71, 124, 144, 170, and 176).

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

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. Virtually all Inupiat residents rely on subsistence resources directly or through kinship sharing. 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.

The objective of this study is 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. This study will:

- identify what people observe and anticipate as the positive impacts and opportunities of OCS activities and the negative impacts and risks of OCS activities;
- quantitatively describe direct impact experiences and anticipated experiences by bowhead hunters;
- document actual experiences and match the impact with the reporting unit experiencing the impact (e.g., whaling crews, households, individual hunters, elders); and
- identify and quantify the preference for potential mitigation measures that hunters and subsistence communities believe useful to reduce social and cultural impacts from OCS related activities.

This study will involve reviews of the literature, including previous testimony, and the methodologies and survey questionnaires used in past social indicator studies conducted by MMS. Focus group meetings will be held in Nuiqsut, Kaktovik, and Barrow to assemble a list of residents' observed and anticipated impacts and concerns. Information will be collected on residents' views of possible remedies or mitigation measures related to those concerns and impacts. This study will be coordinated with the NSB, AEWC, and village contacts as appropriate. The literature and focus group data will be used to develop a draft questionnaire which will be pretested in the communities, resulting in subsequent revisions to the questionnaire. Coordination with AEWC, NSB, and community contacts will be essential to enable face-to-face interviews in Barrow, Nuiqsut, and Kaktovik.

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 decisionmaking processes.

Traditional Knowledge/Western Science Bowhead Whale Migration Seasonal Report

Observations by subsistence-whale hunters 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.

This study will create 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 to provide a synthesis of scientific results and Inupiat observations of bowhead whale behavior.

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

- bowhead migration near their whaling grounds,
- weather and ice conditions,
- unusual natural occurrences or whaling incidents, and
- 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 Inupiat-language translations. The information collected from the community will be carefully coordinated with appropriate subsistence organizations.

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 use both bodies of knowledge through the same forum will help administrators avoid misunderstandings and will, in effect, facilitate a melding of both knowledge systems. The reports should 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.

New Research Projects

Pacific Region



Environmental Mitigation Monitoring

Without demonstrated compliance with mitigation measures and project conditions, it will continue to be difficult for the MMS to have oil and gas operations proceed in a timely manner in the Pacific OCS Region. The Region expects further development of the oil reserves in the Northern Santa Maria Basin, and additional drilling has started from existing platforms.

This study is a continuation of the field analysis segment of an earlier 4-year study of the same title which occurred between 1997 and 2000. The study goals are to observe, sample, and/or monitor postlease OCS oil and gas operations in the Pacific OCS Region to determine environmental compliance (MMS regulations, lease sale stipulations, NEPA requirements, and non-MMS agency requirements, etc.) with mitigation measures or project conditions and their effectiveness. Examples of future field monitoring studies could include:

- additional endangered species detection studies to ensure compliance with the Endangered Species Act,
- high energy seismic survey related monitoring to ensure compliance with project conditions,
- biochemical profiling of shell mounds in the vicinity of the platforms to determine the feasibility of deepwater compliance with debris removal, and
- collecting drilling discharges and sediment transport samples in the vicinity of hardbottom areas to determine compliance with mitigations to protect those resources.

The type of data collected will be determined by Pacific OCS Region environmental management and scientists as specified by the particular project and will depend on the specified approval conditions.

Environmental compliance monitoring data would be used by the MMS to evaluate mitigation measures and project conditions of postlease OCS oil and gas operations. In order for MMS to make better decisions on oil and gas postlease operations, the Agency needs to monitor and observe the operations in the field for environmental mitigation compliance and to determine effectiveness of the measures. Information from environmental mitigation monitoring studies would help decisionmakers to develop more feasible and scientifically defensible mitigation measures and project conditions for future oil and gas operations.

Santa Maria Basin/Santa Barbara Channel Natural Tar Seep Mapping

Numerous active natural tar seeps in the area of active Pacific OCS operations release oil into the ocean every day. The best source of information documenting and mapping their presence in the Santa Barbara Channel is a report which documents the presence of over 2,000 seeps in State waters in the Santa Barbara Channel alone (State Lands Commission, 1978). There are no other comparable data for the Santa Maria Basin and no study in the past 20 years in the Santa Barbara Channel.

About 1,000 barrels of oil seep naturally each day from the seabed in U.S. marine waters.

The objective of this study is to determine the location, volume, and chemistry of natural tar seeps in the Santa Maria Basin and western Santa Barbara Channel. A remotely operated vehicle would be used to sample pre-planned transects in each of the targeted areas to quantify the number and activity of tar seeps. Samples of tar would also be collected. Tarballs would also be collected at key depositional locations along the shoreline for analysis. Selected samples of oil from offshore platforms would also be collected as appropriate. Collected samples of tar and tarballs would be analyzed and fingerprinted. Volumes of gas and oil would be quantified. Shoreline deposits would be mapped in relation to their seep origin.

The information is needed to assess natural seepage so that OCS operations can be placed in context with the natural environment. This is especially true as regards MMS's responsibility to assess the risk of oil spills in the marine environment compared to the effects of other sources of hydrocarbons. The MMS needs to be able to determine the direct impact from our operations, and be able to conclusively determine that oiled areas along the shoreline are or are not from OCS operations.

A Synthesis of the Distribution of Hard Bottom Communities in the Santa Barbara Channel (SBC) and Santa Maria Basin (SMB) Compiled from Existing Data from Biological Surveys and Environmental Studies

Nearly 200 videotapes, written reports, slides, and maps were generated from site-specific biological surveys in the SBC/SMB. Additional data and information may include pipeline corridor surveys and platform jacket surveys.

The objectives of this study are to:

- compile this information into a synthesis correlated with latitude, water depth, sedimentation and other factors; and
- determine the commonalities and differences among the communities found on the hard bottom features in the Pacific Region.

One of the driving forces behind requiring biological surveys is the concern that the communities are rare, contain long-lived species and, therefore, require protection. This study will help to increase our understanding of these communities and help MMS scientists properly mitigate potential impacts. Lastly, gaining an overall view of the patterns of communities would provide valuable scientific information useful to government, academia and industry.

GIS System Development Cooperation Agreement with UCSB

The University of California, Santa Barbara (UCSB), working cooperatively with the Channel Islands National Marine Sanctuary, has developed an extensive set of geographically oriented environmental and socioeconomic data that is specific to the Sanctuary. With the obvious emphasis of the Sanctuary on the marine environment, these data are highly applicable to the MMS. Examples of data in the Sanctuary system of interest to the MMS are seabird colonies, important commercial fishing areas, and shipwrecks. However, the geographic area covered by

the Sanctuary data is very limited compared to the entire Pacific OCS Region. Also, some data of interest to the MMS has not been included in the Sanctuary system, such as hard bottom features.

The goal of this project is to have UCSB develop a GIS database for the Pacific Region that would both incorporate the Sanctuary data set and expand it to cover the Southern California Planning Area. The UCSB would also incorporate existing MMS and other agency data sets in non-digital formats (e.g., hardcopy maps, data lists, etc.) into the final GIS database. The UCSB should also be able to make certain that the MMS has the most recent data available and is current with other agencies.

This study is intended to add to the information found within the Pacific, capitalizing on the work of other State, local, and academic groups. Using the Sanctuary database as a starting point, UCSB will locate similar data sets for the entire Southern California Planning Area, if available, and incorporate those data into the database.

Information disseminated from the proposed research will aid the MMS in permitting oil and gas development and production projects in the Southern California Planning Area, including those in the Santa Maria Basin and Santa Barbara Channel. Additionally, study results would be used to enable the MMS to make more informed, scientifically defensible decisions on future postlease issues with respect to preparation of NEPA documents, such as EIS's, environmental assessments, and records of decision.

New Research Projects

Headquarters



Bottom Boundary Flow in the Offshore Continental Shelf

Coastal ocean circulation is forced by buoyancy, wind stress, surface and internal waves, inertial waves and the tidal flows, and it is modified by lateral and bottom boundaries. Each shelf region displays different circulation phenomena even with similar forcing. Bottom boundary layer flows generated from several driving forces run over rough and irregular surface that strongly modify the physical processes of water movement and dispersion characteristics. The creeping motion of the bottom sediment along the continental slope and shelf region is thought to be an effective transport mechanism of industrial pollutants. However, the variations and transient characteristics of bottom boundary layer flows along the outer shelf and inner shelf are not well studied. The level of understanding on near ocean bottom flows for pollutant transport in the OCS is minimal. This study will provide a clearer understanding of potential bottom pollutant transport information needed to assess potential impacts for deepwater leasing.

Recently, the Office of Naval Research announced plans to start a new Division Research Initiative (DRI) on Bottom Boundary Layer Flows with the main objectives of understanding the formation and evolution of bottom boundary layer flows and focusing on transient characteristics of these flows driven by various forcing mechanisms. The MMS has been invited to co-sponsor the Bottom Boundary Layer Flows initiative, which will provide for theoretical analysis and numerical modeling and field studies to be conducted simultaneously through this DRI. The program will use theoretical analysis to guide field studies, and will use field data to verify theoretical results and numerical prediction. The objective is to advance scientific understanding of bottom boundary layer flows in order to properly parameterize the boundary feedback mechanisms for the subsurface circulation processes, and apply this understanding to modeling efforts in evaluating the spread of bottom discharges of fluids along the slope and rise of the ocean. This information will be applicable to deepwater shelf and slope areas in all regions. It will also support deepwater preleasing and postlease assessments of the risk of oil spills originating from subsurface blowouts and the discharge of fluids at the seafloor.

Survey of Environmental Impact Assessment Models

Environmental assessments for offshore oil and gas activities combine risk analysis and impact analysis. The MMS has long been at the forefront of oil-spill trajectory modeling and spill risk assessment. Through the use of spill rates and a point trajectory model, MMS generates probability statistics to estimate the relative spill risk to an environmental resource or geographic area. For the purposes of impact analysis under NEPA, MMS analysts estimate the effects of spilled oil on a particular resource based on available scientific knowledge and expert opinion. The integration of these two types of analysis (risk and impact) has always been a key issue in the preparation of NEPA and other environmental documentation.

The scientific community has made considerable advances in recent years in the quality of impact assessment tools and the databases that support them. The potential for linking physical fates models with environmental effects models holds promise for bridging the gap between risk assessment and impact assessment. Although some efforts have been undertaken in this direction, development and enhancement of such capabilities and integrating these tools is fraught with scientific, technical and organizational difficulties.

The study's objective is to lay the foundation for sound scientific development and use of impact models by MMS through a review of the state of the art and science of environmental impact assessment modeling. The study must provide an objective reporting of existing tools' capabilities, functions, strengths, and weaknesses without advocating or recommending any particular methodology or product line for implementation. The MMS needs to use the best available impact analysis tools for NEPA compliance and other environmental documentation. This may greatly improve the use of existing data and the quality of MMS environmental assessments.

Model Development or Modification for Analysis of Benthic and Surface Plume Generation and Extent During Offshore Dredging Operations

A potential point of impact during marine mineral development (such as dredging for sand and gravel, shell, or placer deposits) is the benthic communities that lie within the path of the plume created at the sediment/water interface. The effects of this stirring up of bottom particles may include burial of some species of non-mobile bottom organisms and decreased organism growth and reproduction if turbid conditions are prolonged and persistent. A major long-term concern is the potential impact on bottom organisms and populations resulting from the altered substrate as a consequence of the blanket of fine-grained sediment raining down from the benthic plume.

Various models have been developed to estimate the levels of sediment disturbance and suspension associated with dredging activities and water column discharges. In large part, these models have been concerned with coastal, river, or other nearshore waters and processes and not with the open ocean or OCS. Therefore, they are generally not suited for impact analysis in the areas with which the MMS is concerned. In addition, the current models that have been developed to predict dredging impacts do not correctly predict the physical processes both at the over-spill point of the dredge vessel and at the draghead.

The purpose of this study is to develop or modify an existing mathematical model which can be used to predict the level and extent of bottom sediment disturbance and resulting near-bottom turbidity and the degree to which the disturbed sediment persists within the near-bottom water layers during offshore sand and gravel dredging operations. Using available biological information, the model runs could then be used to help predict the potential level of impact on resident benthic biological communities in specific areas.

Using the data and results from MMS-UK studies, a mathematical model will be formulated, or an existing model will be modified, to estimate the level of disturbed bottom sediments in the near-bottom water layers during mineral development. Factors to be considered for the bottom sediments will include: specific particle size distribution, bulk and particle density, and surface chemistry and cohesiveness of the disturbed material. Since the ultimate fate and subsequent impact of the disturbed material are highly dependent upon the physical characteristics of the receiving waters (current profiles, turbulence, thermal structure, etc.), the model should be able to account for the various current regimes present in various OCS areas of the United States.

The information provided by the model runs will prove invaluable during preparation of hard minerals EIS's and will provide needed detail regarding the degree to which bottom sediment

disturbance might impact benthic organisms and what organism might be affected. The results provided by the model will enable EIS analysts to better assess the potential impact of offshore mining. Information is required for possible hard mineral EIS's and for leasing and development decisions for OCS areas where offshore mining activity may occur in the future, such as off the Atlantic and Gulf of Mexico coasts and other areas of the OCS where potential mineral resources are being evaluated. The NEPA documents will need to be prepared to support negotiated lease agreements in FY 2002 and beyond, as the State/MMS Task Forces identify potential new sources of sand for beach and coastal restoration.

Environmental Surveys of Potential Borrow Areas Offshore Northern New Jersey and Southern New York and the Environmental Implications of Sand Removal for Coastal and Beach Restoration

The State of New Jersey and the U.S. Army Corps of Engineers are currently identifying new OCS sources of material for beach and coastal restoration offshore northern New Jersey (Sandy Hook, Belmar, and Sea Bright) and southern New York (south of Long Island). The level of detail regarding the biology and physical characteristics of these areas is not adequate at this time to make reasoned decisions regarding the environmental consequences prior to actual dredging of the areas.

The purpose of the study is to determine, prior to actual dredging of the identified sand resource areas, the likelihood of adverse environmental impact on the resident biological organisms and physical characteristics. The study will involve biologic and physical surveys on and around the identified sand resource areas. Shipboard biological reconnaissance methods will be used to determine the likelihood of impact on resident biological communities. Numerical modeling will be used to determine the potential effects of dredging on the local wave climate and nearshore sediment transport processes.

The information gathered from this study is required for a possible hard mineral EIS and leasing and development decisions in relation to dredging of sand for restoration of areas experiencing severe erosion. Information gathered as a result of this study is crucial to an adequate assessment of potential dredging impacts prior to actual sand recovery.

Development of An Updated Air Quality Model for OCS Application

As air quality models for onshore use become more advanced, the models used for the OCS need to be updated. It is important that MMS have an available model that incorporates current knowledge concerning atmospheric boundary layer structure and dispersion. The purpose of this study is to modify and adapt one of the Environmental Protection Agency's "next generation" models to incorporate over-water boundary layer and dispersion characteristics. In this study, MMS will evaluate CALPUFF and similar types of models to determine how they can be modified or enhanced so they can be used to evaluate air quality impacts from offshore emission sources. The MMS will choose a model that will then be modified and tested using available data. The resultant model will be used by the OCS operators in their submittal of plans and by MMS in analyzing air quality impacts for lease sale EIS's.



The Department of the Interior Mission

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering sound use of our land and water resources; protecting our fish, wildlife, and biological diversity; preserving the environmental and cultural values of our national parks and historical places; and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to ensure that their development is in the best interests of all our people by encouraging stewardship and citizen participation in their care. The Department also has a major responsibility for American Indian reservation communities and for people who live in island territories under U.S. administration.



The Minerals Management Service Mission

As a bureau of the Department of the Interior, the Minerals Management Service's (MMS) primary responsibilities are to manage the mineral resources located on the Nation's Outer Continental Shelf (OCS), collect revenue from the Federal OCS and onshore Federal and Indian lands, and distribute those revenues.

Moreover, in working to meet its responsibilities, the **Offshore Minerals Management Program** administers the OCS competitive leasing program and oversees the safe and environmentally sound exploration and production of our Nation's offshore natural gas, oil and other mineral resources. The MMS **Royalty Management Program** meets its responsibilities by ensuring the efficient, timely and accurate collection and disbursement of revenue from mineral leasing and production due to Indian tribes and allottees, States and the U.S. Treasury.

The MMS strives to fulfill its responsibilities through the general guiding principles of: (1) being responsive to the public's concerns and interests by maintaining a dialogue with all potentially affected parties and (2) carrying out its programs with an emphasis on working to enhance the quality of life for all Americans by lending MMS assistance and expertise to economic development and environmental protection.