POTENTIAL CMI STUDIES, MMS ALASKA ENVIRONMENTAL STUDIES PROGRAM

Region: Alaska

Planning Area: Beaufort Sea

Title: Ecological and Oilspill Implications of Beaufort Sea River Plumes

MMS Information Needs to be Addressed: Understanding nutrient characteristics of river plumes will improve predictability of location and productivity of all trophic levels including benthic, plankton, fish and marine mammals. Understanding the physical characteristics of river plumes will improve our ability to predict the effects and geographic spread of oil spills near the biologically productive river mouths of the Beaufort Sea. This information will be used for NEPA analysis and documentation for both Beaufort Lease Sales and Development and Production Proposals.

Period of Performance: Three years

Description:

Background: River mouths are biological hotspots. The Colville and Mackenzie River plumes strongly influence Beaufort Sea oceanographic conditions, primary productivity and exert cascading effects on the distribution and abundance of zooplankton, fish, and marine mammal populations. Little data is available to define plume characteristics. Unverified assumptions about river plume effects on primary and secondary productivity can lead to flawed assessments of potential effects of oil and gas development on wildlife. Also, the oil spill model does not include river plume conditions that could affect the spread of oil.

Beaufort Sea productivity may fluctuate with changes in sea ice cover, nutrient runoff from land, coastal erosion processes, and turbulence mediated by the river plumes. Documentation of variability and changes of baseline conditions due to these factors, is necessary to eliminate oil and gas development as the cause of possible negative effects.

Recent advances in satellite imagery, such as the SeaWiFS (Sea-viewing Wide Field-of-view Sensor) launched in 1997, make possible a more rapid and inexpensive evaluation of primary productivity fluctuations both seasonally and year to year.

Objectives:

1. Develop and test SeaWiFS algorithms for Beaufort sediment-laden river plumes.
2. Test the hypothesis that river plume characteristics determine location of centers of primary and secondary productivity in the Beaufort Sea.
3. Test the hypothesis that river plume characteristics remain static seasonally, annually, and decennially.

Methods:

1. Develop initial algorithms to evaluate primary productivity in turbid coastal waters of the Beaufort Sea. Compare existing SeaWiFs and MODIS (Moderate Resolution Imaging Spectroradiometer) satellite measures to existing *in situ* measures (e.g. from ANIMIDA) of chlorophyll, colored dissolved organic mater, suspended sediments, salinity, and temperature. Refine using SeaWiFS and MODIS images synchronous with new measures from ships and drifters.
2. Evaluate variability of plume characteristics over seasonal, annual, and Arctic weather cycles. Assess relation to coincident changes in sea ice cover, nutrient runoff from land coastal erosion processes, and turbulence.
3. Describe ecological implications of river plume characteristics to upper trophic levels and present general recommendations relevant to off shore oil and gas development.

Date information is required: An annual report based on preliminary algorithm is due in second year. The final results of hypotheses testing are due the final year.