

Coastal Response Research Center/Oil Spill Recovery Institute
Workshop: “NRDA in Arctic Waters: The Dialogue Begins”
Anchorage, Alaska
April 20-21-22, 2010

Current scientific information suggests that environmental changes are occurring in the Arctic at rates much greater than projected even 5 years ago. These changes are manifesting themselves in sea ice extent and distribution and in other ecosystem shifts. Recent models suggest that Arctic waters could be free of multi-year ice in the summer within the next 20 years. These changes suggest that over the next 10-20 years ship activity will dramatically increase. Predictions of large reserves of oil and gas are increasing pressure for hydrocarbon exploration and production. One likely result of increased activity in this harsh environment will be the accidental release of petroleum into the marine environment.

When significant amounts of oil are accidentally released into Alaskan Arctic waters, it will be challenging to recover oil, especially if ice is present. Even under best-case scenarios, it is likely that a substantial amount of oil will be left in the environment after a response is completed. At that point, a Natural Resource Damage Assessment will be initiated in order to (1) assess the types and magnitude of injuries to natural resources or to services provided by those resources and (2) identify appropriate restoration that will fully compensate the public for the injuries.

Prudence and sound natural resource management require that we anticipate such a disaster and plan to quickly and efficiently conduct injury assessment and implement restoration. Because of the remoteness of the Arctic and harsh, extreme, and variable environmental conditions, there are gaps in our knowledge of the Arctic ecosystem. The rapid environmental changes create challenges for determining the baseline condition of Arctic habitats and species in the absence of a spill. For these reasons, natural resource trustee agencies are initiating discussions on issues and information needed to resolve a Natural Resource Damages claim. Towards this end, the Coastal Response Research Center (CRRC) in cooperation of Oil Spill Recovery Institute (OSRI) will sponsor a workshop in Anchorage aimed at initiating this dialogue.

The immediate goal of this workshop is to initiate a dialogue among NRDA practitioners and Arctic scientists that will identify the most significant data gaps in our understanding of the ecologies of resources potentially at risk from oil released into Alaskan Arctic waters, including fate and exposure pathways. As with most CRRC workshops, overarching questions have been developed and will be presented to the workshop organizing committee (OC) for their consideration. The OC will consist of representatives of a diverse group of NRDA stakeholders and scientists. The OC will be responsible for setting the specific objectives of the workshop, establishing the format to achieve these objectives, and identifying and inviting a diverse group of knowledgeable and pragmatic participants.

Questions and desired outcomes include:

- 1) A preliminary understanding of which key resources/habitats might be at risk from spills and spill response
 - Questions that might feed this outcome:
 - a. What are the primary pathways of exposure, e.g., via physical pathways, via biological pathways, other pathways?
 - b. What are the gross ecosystem models that exist for these environments and how can they inform us of likely NRDA concerns (e.g., ice covered areas are

generally characterized by benthos-focused ecosystems with plankton being the nexus between surface exposure and benthic exposure)

- c. What is the baseline condition for key resources at risk? (e.g., what is the current status of these key resources relative to ‘tipping points’? How does the status change as a function of seasonality?)
 - d. What do we need to know about the ecology and baseline conditions to effectively quantify injuries related to survival, growth, or reproductive impairment? (e.g., what is the relationship between indicators of effects [e.g., reproductive impairment] and ‘service losses’?)
 - e. How are Arctic ecosystems changing in response to climate change? How will the identified resources at risk change as a function of climate change (i.e., how is baseline changing)?
 - f. How can we accommodate these changing baselines in our NRD assessments?
 - g. How do we address the effects of cleanup activities?
- 2) An understanding of the likelihood of petroleum exposure to these key resources as a function of seasonality
- Questions that might feed this outcome:
- a. How will the exposure pathways vary as a function of seasonality? (e.g., does the presence of ice affect the likely pathways - how? Will temperature differences between summer and winter significantly alter the fate and transport of petroleum in the environment?)
 - b. How will biological exposure vary as a function of seasonality?
 - c. How will biological effects as a result of exposure to petroleum vary as a function of seasonality?
- 3) Identification of injury assessment models that are applicable to Arctic habitats/resources
- Questions that might feed this outcome:
- a. To what degree is Habitat Equivalency Analysis an important tool to use in the Arctic? Spills on beaches? Intertidal? Shallow subtidal? How does such a holistic habitat-centered approach allow us to deal with integrative service losses?
 - b. How can injuries to open water and ice habitats be evaluated?
 - c. How do we apply ecosystem level approaches? How can food webs or trophic components be evaluated? How can we best model to higher level animals, what evidence is required that the higher trophic level really is injured?
 - d. How do we address the human uses of the habitat/resources?
- 4) Achieve consensus on most significant data gaps necessary to prepare for NRDA (i.e., what we need to study further?)
- Questions that might feed this outcome:
- a. Have we identified all/most of the major resources at risk from an oil spill?
 - b. Do we have a good understanding of the fate and transport of petroleum in Arctic conditions (e.g., on ice, in water, with dispersants)?
 - c. What additional biological, physical, chemical information is needed regarding seasonal changes in Arctic ecosystems (e.g., biological changes caused by temperature effects, by physical processes)?
 - d. What additional information is needed regarding longer-term baseline changes (biological, physical, chemical)?

- 5) Achieve consensus on the key injury questions to discuss in future workshops:
- Questions that might feed this outcome:
- a. What do we know about ‘threshold’ exposures to petroleum – can we determine biological significance of exposure to lower trophic levels? (e.g., is there a threshold impact to krill such that beyond this, marine mammals that feed on them are injured?).
 - b. What do we know about most sensitive life stages to petroleum exposure in arctic environments?
 - c. Do exposure indicators indicate injury in Arctic species?
 - d. Is bioenergetics a viable approach to understanding and evaluating NRD injuries in the Arctic? What are the energy levels of shifts in food? How much energy can you lose from the system before the higher level population is affected? Which species are more sensitive to these effects? Is there a demonstrable relationship between bioenergetics and population level success? To what degree does bioenergetics respond to baseline changes? Is there too much uncertainty in this approach?
 - e. How should we define or evaluate ‘population-level’ injuries- either from acute or chronic exposures?

An additional very difficult question will be addressed in a panel discussion at a future workshop: What about restoration? Is it possible to restore any of the species likely to be injured?

Organizing Committee:

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 Mary Baker, NOAA ORR
 Catherine Berg, US FWS
 Nancy Bird, OSRI
 Dale Gardner, AK DEC
 Nancy Kinner, UNH CRRC
 Ken Lee, Fisheries & Oceans Canada

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