CONCEPTUAL MODEL APPLIED: PLANNING FOR OIL SPILLS ON A REMOTE ISLAND

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Isle Royale is an island six hours by boat off the U.S. shoreline in Lake Superior. It is a National Park and an International Biosphere. It is within one mile of shipping lanes and there have been several accidents on or near its shores over the years. Although the Island has a limited amount of equipment and the staff of the US National Park Service has been trained to use it, the Island is not inhabited all year round and is deserted during the most treacherous times for shipping. The National Park asked for assistance in developing a specific preparedness strategy for Isle Royale. This was our first test of the conceptual model for advanced planning.

This conceptual model is a template for advanced planning to protect the environment. It also provides a response tool by identifying both resources at risk and the equipment and techniques to protect and clean up any spill that would threaten the resources at risk.

Preparedness has for several years followed an emergency management model that focused on notification, jurisdiction, command and control and communication. Plans were written defining authorities, explaining the interaction of different entities during different scenarios, providing call down lists and resource lists, and encouraging the testing of the plan through training and exercising. Sometimes changes in physical structures or equipment were also included in the goals of exercises. This cycle was to be repeated. Too often though, once the plan was written and exercised, it was shelved for other activities.

Good planners and responders always said that a plan was never finished, but there was no template to follow that moved beyond the initial phase. Much of the reason for not moving beyond the initial phase is the specialization that would be required and the intensity and expense of the activity. This conceptual model allows us to, in a systematic and scientific way, move further into the planning process.

The model envisions a four phase approach, starting with the geographical representation of resources at risk, followed by an intensive face to face scientific meeting to examine the information available, the choosing of geographically specific protection strategies based on the scientific examination and the constraints of the specific geographic location, and, finally, the geographic notation of suggested operational techniques linked to specific how-to instructions.

These four phases are each supported by a tool or process that can stand alone but may link to the other tools or processes through this template and the efforts of the planners and responders. If the entire template is developed for a specific area, the responder is presented with a map that includes the resources that need to be protected and suggested methods of doing so in a concise easy-to-read map/document. The four phases are described below.

The resources at risk are first extensively documented and put into a GIS system. We use the Natural Heritage Data Base for species and obtain information on land management from natural resource trustees at both the Federal and State level. This data is initially mapped at the 1:24,000 scale and then sent to reviewers at all levels for verification. The reviewers correct any misinformation and add data. The GIS is reworked and final maps are created. The maps become addenda to contingency plans. The maps are widely used by responders as a screening tool for what concerns they have as they approach a spill. We call these maps the Inland Sensitivity Atlas. Any GIS will work as long as it is comprehensive, collected at a uniform and relatively large scale and has gone through a thorough review process by locally knowledgeable experts.

The maps for Isle Royale were created as part of the Inland Sensitivity Atlas[1] for Region V. Sensitive areas are documented and mapped at the 1:24,000 scale. The data is verified and sent to reviewers who add or delete data based on local knowledge. The Inland Sensitivity Atlas for Isle Royale was completed in September of 2000.

The second phase tool is the Net Environmental Benefit Analysis (NEBA), a resource management tool designed to improve the quality and results of environmental decision making. NEBA is a consensus-based process that brings natural resource science together with the reality of resource management decision making. When applied during contingency planning, it provides a means for considering proposed environmental actions, comparing and contrasting the trade-offs and environmental considerations of those actions, and then prioritizing the outcomes through a risk-ranking exercise.

When used by natural resource scientists and resource management decision-makers, the NEBA process creates an open, honest dialogue of the capabilities and limitations inherent in resource management and the decision-making tradeoffs faced by resource managers today. This allows the decision maker to weigh the environmental concerns, public safety, response capabilities and political influence whereas previously the environmental concerns were diffuse and often not scientifically based.

In January of 2004 we conducted a NEBA for Isle Royale. The first NEBA to be conducted for a freshwater ecosystem, participants included the National Park Service, the Department of the Interior, the U.S. Coast Guard, the Environmental Protection Agency, Environment Canada, the National Oceanic and Atmospheric Administration, the Great Lakes Commission, Minnesota Pollution Control Agency and several response contractors. We used a scenario that saw a ship go aground northeast of the main island of Isle Royale and lose 30,000 gallons of IFO 180 oil (fuel for the ship). We looked at several habitats

Ecosystem	Definition
Terrestrial	Uplands beyond the splash zone
Coastal Wetlands	Wetlands that are hydro-dynamically linked to the Great Lakes
Shoreline	Above the normal waterline to the high splash zone
Near shore	Shallow water from the emergent vegetation line outward
Reefs	Submerged aquatic structures supporting plant and animal life
Open Water	Surface water and water column not associated with other eco-types

We chose driver species for the following category of species

Vegetation

Mammals

Birds

Herptiles

Fish

Macro/Microinvertebrates

We looked at each species in each habitat and evaluated what would happen if the species encountered oil in the habitat. Obviously certain categories of species go with certain habitats but we evaluated all appropriate species and ranked what would happen to the species on a matrix that had intensity of impact and length of time for the population to recover. The evaluation of the no action option provided a baseline from which we would evaluate different response technologies.

We then looked at three different response options as follows:

Mechanical Removal	oil and oiled sediments are physically removed with mechanical equipment
Shoreline Cleaners	water and chemical cleaning agents on oiled shorelines
In-Situ Burning	controlled burning of oil at the location of the spill

We filled in a matrix that compared the species in habitats under different response options to create a risk ranking matrix[2]. This risk-ranking, with some further manipulations, allows us to identify the best clean up option for the species. However, because it might be marginally better for one species, doesn't mean we are physically able to use that technology, doesn't prioritize one species over another, and doesn't necessarily mean it is best for a habitat.

We then need to look at our third tool which is protection strategies. Protection strategies combine techniques that can work in an environment, the availability of equipment and trained people to use the equipment. Protection strategies are specific to a location and it is extremely resource intensive to develop since all the aspects of location must be taken into consideration such as water level, current, debris, shoreline type, and availability of equipment.

In order to develop protection strategies for Isle Royale, a committee met at the park to begin field assessments of potential response strategies at high priority areas identified by the park. Nineteen areas were identified as high priority. Most of them were embayments with harbor facilities or other improvements and all of them had high quality habitats and rare species present. Two teams looked at the areas by boat, on foot and from the air. A basic set of strategies was developed[3] for incorporation into the Inland Sensitivity Atlas. These response strategies were mostly tied to what could be expected of park personnel with available resources following a spill before any other response organizations could effectively mount the next phase.

In addition to the response strategies document, Marine Pollution Control (MPC), the designated Oil Spill Response Organization for the park, prepared a document entitled "Strategic Protection Plan, Response Considerations: Isle Royale National Park.[4]" This document is a critical look at additional considerations and strategies that trained park personnel could employ. Those techniques would augment traditional protection and deflection booming techniques capitalizing on park assets such as available boats, trained personnel, etc.

Finally, EPA has developed an inland Oil Spill Online Resource[5] which provides a standardized way to document response techniques, assemble techniques into strategies and locate them on a map or GIS product in a concise and uniform manner. This tool takes the randomness out of choosing response strategies and allows for a systematized way of documenting strategies both for NEBA and for protection strategies. By using this system, we begin to establish a system that is specialized to an area yet is universal enough that all responders can quickly identify and perform the techniques called for. It means that the responder is given a first choice of a technique to try. This tool can allow for extrapolation of the findings from this concept to be extrapolated to like places where the resources to perform such intense planning are not available. The tool applied, could become the base of a "model".

The major use of this conceptual model is that it points to the gap between need and current status and points the way for the planning group to work on closing the gap. This is currently in progress for Isle Royale and indications are that there will be a wide ranging list of prevention options employed, since a spill at Isle Royale would be environmentally devastating and extremely difficult to respond to. Examples of such efforts are banking seeds of very rare plants, and coordinating with various agencies on transportation policies. In addition, innovative uses of equipment normally used for other purposes have been proposed. Finally the Area Committee will take on the daunting task of streamlining the response for outside responders to cut hours and maybe days off of response times. By following this process, Isle Royale will be able to make informed decisions and planners can focus their attention on better more specific procedures and exercises.

ENDNOTES

1 U.S. EPA Region 5, Great Lakes Commission, U.S. Geological Survey Upper Midwest Environmental Sciences Center, U.S. EPA Inland Sensitivity Atlas-Michigan Upper Peninsula, September 19, 2000

2 T. Rayburn, Net Environmental Benefit Analysis for Isle Royale National Park: Duluth, Minnesota Final Report: Proceeding from the Workshop held January 6-8, 2004. Retrieved from *http://www.glc.org/irps/irps/docs/NEBA-final.pdf*

3 T. Rayburn, Isle Royale Protection Strategies: July 2003. Retrieved from http://www.glc.org/irps/irps/docs/ISRO-ProStrat.pdf

4 M. Rancilio, M. Popa, W. Hazel. Strategic Protection Plan Response Considerations Isle Royale National Park, August 10, 2003. Retrieved from *http://www.glc.org/irps/irps/docs/IRReport081703_full.pdf*

5 H. Allen, Inland Oil Spill Online Resource retrieved from *http://www.ertresponse.com/iosor/*