PRELIMINARY DRAFT FOR COMMENTS

Title
<mark>Restoration of Selected Wetlands Affected by the Exxon Valdez Oil Spill.</mark>

Background

The March, 1989 Exxon Valdez oil spill (EVOS) impacted more than a thousand miles of coastal resources in the Prince William Sound and Gulf of Alaska, directly affecting the region's habitat and its related animal populations as well as its recreational, educational, and aesthetic values. Historical attempts for cleaning up oil in marshes has shown that clean-up methods that disturb the soil or hydrology of the marsh will have long term effects equal to or more severe than direct oiling. In addition, oil removal from marshes is a slow natural process because they are sedimentary, anaerobic habitats with minimal flushing. However, most marshes have only slight or no damage as the result of either the initial oiling or clean up effort. Without reduction of oil to soil concentrations less than some critical value, regrowth in the oiled area will not occur. The scientific literature does not establish the limits at which salt marsh plants can be reestablished. *clearly (there are some articles - read or speak w/Seneca?, Rest of marsh veg impacted by the AC. + subsequent c/u ops (the Whande France)*

Once initial activities were underway, planners addressed the mid and long-term restoration processes. A draft restoration plan prepared by the interagency Restoration Planning Work Group (RPWG) was updated in July, 1990. This report defines restoration as "actions undertaken to return an injured resource to its baseline condition, as measured in terms of the injured resources's physical, chemical, or biological properties or the services it previously provided" (RPWG, 1990). A detailed restoration plan will be finalized by ~~the end of 1990~~ *2nd anniversary date*

The restoration process facilitates recovery of the ecosystem as indicated by some measure of its structure, function, diversity and dynamics. The restoration activity is not necessarily the end of the process, but rather one which sets the stage for natural recovery over time. In this case, restoration "success" will be defined simply by plant survival or growth over time.

The Study Area

Field observations in both Prince William Sound and the Gulf of Alaska indicate that some wetland sites, particularly those which were not physically cleaned, have yet to fully recuperate from the impact of the spill. This is particularly the case in heavily and moderately oiled marshes, probably a result of too much oil still being present in the substrate to permit natural recovery. Recovery of oil impacted marshes in Prince William Sound and the Gulf of Alaska may be slow as these marshes are small, low energy sites, especially compared to those of major river deltas such as the Copper River. Because of their limited extent and their patchy distribution, opportunities for natural recolonization through seeding or propagule dispersal are also extremely limited. Although marshes are limited in areal extent, they are ecologically important, serving as feeding and resting areas for migratory waterfowl and other birds and as

alternative food sources for browsing mammals, especially in harsh winters. Therefore, restoration of this habitat in Prince William Sound and the Gulf of Alaska should be a high priority.

Goal

The goal of the project is to accelerate natural recovery of intertidal wetlands affected by the Exxon-Valdez oil spill.

The restoration program will consist of two components. The first will evaluate survival of transplanted materials in two, small, low-energy heavily-oiled marshes. The purpose of this component is to determine when these marshes will be suitable for transplanting. The second component will evaluate individual wetlands in Prince William Sound and the Gulf of Alaska (GOA) to determine whether or not restoration is needed and if it is, apply the appropriate method. A detailed proposal which is being prepared which will address criteria to allow for the selection of the most appropriate restoration techniques.

Component I

Objectives

1. Determine survival rates for transplanted (plugged) plants as an indicator of the ability to assist natural revegetation processes in small impacted wetlands.

2. Determine if there is a threshold of oil fractions in the sediment below which transplanted plants are more easily established.

Methodology

We propose a phased plant transplanting (plugging) Carex sp and Zostera sp at segment KN136 on the Bay of Isles, and Puccinella sp at segment _____ in Tonsina Bay on the Kenai Peninsula.

The first annual planting will be undertaken in the spring of 1991 and continue through 1994. Pluggings will be collected from nearby sources. A randomized block system will be utilized to determine planted and control plots. Approximately 10 to 15, 2 m^2 planting plots per year and 15 control plots per site will be established. The annual planting plots will be randomized within the middle to upper intertidal region for Carex sp and Puccinellia sp. , the lower intertidal region for Zostera sp..

Field work will commence in the spring of 1991 when the test sites will be surveyed, characterized (substrate, intertidal location. oil fraction, vegetation type), plots established and described. Monitoring survival and production of seed heads will occur in the spring and fall of each year.   Plant survival count, percent having seed heads, percent cover (as measured through photographs, and soils data (for oil fraction analysis) will be collected from each plot annually.

Objective

1. Enhance the recovery of Wetlands in Prince William Sound and the Gulf of Alaska

Methodology

It is proposed to visit each wetland starting in the eastern end of Prince William Sound. If the wetland is heavily damaged and tests show a lack of oil, transplanting will be done using material from nearby areas. If the area is lightly damaged, a nutrient analysis of the soil will be conducted and if warranted fertilizer will be applied to strengthen the plants and aid in recovery. It is anticipated that a combination of 10-10-10 (for fast action) and Osmocote (for time release) will be used to enhance growth since most marshes are nitrogen limited. In addition as a collateral benefit of fertilizing marshes to increase bacterial activity which will speed the removal of oil. The specifics of the fertilizing scheme will be developed in the full proposal.

Biomass will be monitored at the end of each year for three years to determine if these restoration activities have succeeded.

Parameters to be measured during the project are:

Physical Site Characteristics
- Marsh soil descriptions
- Depth to peat

Chemical Parameters
- Hydrocarbons (according to standard analytical protocols used for the EVOS
- Nutrient Series
    Nitrogen
    Phosphorus
- Water quality parameters
    DO/temperature/conductivity/REDOX

Biological Parameters
- Plant bio-mass (fertilized marshes)
- Percent survival
- Percent of plants with seed heads

Cost Estimate

Sr. Scientist (6 mos)	$ 30,000
Technicians (6 for 4mos)	70,000
Personnel OH	80,000

Travel	50,000	
Ship Time estimated 90 days @ $2000		180,000
Helicopter (70 Hours at $600)		42,000
Float Plane (125 Hours at $300)		37,500
Chemical Analysis		50,000
Lab Space Rental	20,000	
Supplies and Equipment OH		64,500

$ 624,000

$624,000 each year (1991, 1992)
$100,000 (1993)

Rising gas prices — est. 5,000$ to be safe

=∴ 450,000$

Initial Literature Review

1. Baker, J.M. 1970. The effects of oils on plants, <u>Environmental Pollution</u>, 1:27-44.

2. _____. 1971. Seasonal effects of oil pollution on salt marsh vegetation, <u>Oikos</u>, 22:106-110.

3. Cairns, J. and A.L. Buikema, eds. 1984. <u>Restoration of Habitats Impacted by Oil Spills</u>. Butterworth Publishers.

4. Dicks, B. and K Iball. 1981. Ten years of salt marsh monitoring - the case history of a Southamton water salt marsh and a changing refinery effluent discharge. <u>In</u> Proceedings of the 1981 World Oil Spill Conference. Atlanta, GA:EPA/API/USCG.

5. Thorhaug, A. 1980. Recovery patterns of restored major plant communities in the United States. <u>In</u> Recovery Process in Damaged Ecosystems, J. Cairns, ed. Ann Arbor Sciences Publishers.

6. Alaska Departments of Fish and Game, Natural Resources, and Environmental Conservation; U.S. Departments of Agriculture, Commerce, and Interior; U.S. Environmental Protection Agency. 1990. <u>Restoration Planning Following the Exxon Valdez Oil Spill</u>. Final Progress Report.