



EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL ADMINISTRATIVE RECORD

TO: Molly McCammon Bob Loeffler Veronica Gilbert Sandra Shubert Rebecca Williams

FROM: Eric Myers

DATE: 5/20/94

b. -- 1

SUBJ: Cover memos for Invitation to Submit Restoration Projects

For your reference and/or files, attached are the four different cover memos that went out to various parties with the *Invitation to Submit Restoration Projects*.

Exxon Valdez Oil Spill Trustee Council

Restoration Office

645 G Street, Suite 401, Anchorage, AK 99501-3451 Phone: (907) 278-8012 Fax: (907) 276-7178



TO:	Restoration Work Force
FROM:	Molly McCammon, Director of Operations
DATE:	May 19, 1994
SUBJ:	Brief Project Descriptions & Project Budgets for FY 95 Work Plan

The purpose of this memorandum is to provide you with:

- the enclosed material for distribution and use by your respective agencies for preparation of FY 95 Brief Project Descriptions (BPDs), including needed budget information for the BPDs; and
- information regarding preparation of detailed budgets for other FY 95 Work Plan projects as discussed at the recent May 18 weekly Restoration Work Force meeting.

FY 95 Brief Project Descriptions

In order to minimize the editing that will be needed to prepare Brief Project Descriptions for publication as part of the Draft 95 Work Plan, agency personnel should use the guidance and format contained in the *Invitation to Submit Restoration Project Descriptions for Fiscal Year 1995* (copy enclosed). A disk with the outline of information required for Brief Project Descriptions is also enclosed (WordPerfect 5.1). Please have your respective agency Project Leaders provide three (3) paper copies as well as an electronic version of each Brief Project Description to the Anchorage Restoration Office (645 G Street, Anchorage, AK 99501) by June 15 in order to initiate technical review.

Agencies submitting Brief Project Descriptions should provide detailed budget information on standard budget forms (i.e., Forms 2A, 2B, 3A and 3B) along with the project narrative on June 15, if at all possible. At a minimum, summary budget information must be included in the BPD at this time. In order to ensure timely review of proposed FY 95 projects by the Restoration Work Force and the Executive Director, <u>detailed budget forms will be needed</u> <u>no later than Friday, June 24</u>. (Additional instructions regarding the preparation of detailed budget forms will be provided by June Arkoulis-Sinclair/Director of Finance under separate cover.)

Trustee Agencies

State of Alaska: Departments of Fish & Game, Law, and Environmental Conservation United States: National Oceanic and Atmospheric Administration, Departments of Agriculture, and Interior

Other FY 95 Project Budget Information

At the May 18 weekly Restoration Work Force meeting, it was agreed that preparation of detailed project budgets for the FY 95 Work Plan could be completed for certain categories of projects and submitted to the Trustee Council for approval at an August meeting.

Three categories of projects were identified:

- 1) Public Information and Administration;
- 2) FY 94 projects carried forward to FY 95 for report writing and closeout; and
- 3) known FY 95 projects for which interim funding is needed.

The first two categories will have budgets prepared for the entire fiscal year (10/1/94 - 9/30/95), the third category will have a budget prepared for the first quarter (10/1/94 - 12/31/94). As an initial step in this process, please provide June Arkoulis-Sinclair/Director of Finance with a list of your category 2 and 3 projects, along with a brief summary budget no later than the close of business <u>Wednesday May 25th</u>. June will develop a timeline, detailed budget preparation instructions, reformat budget forms, etc. and provide that information to you.

enclosures

— Invitation to Submit Restoration Project Descriptions for Fiscal Year 1995 — WordPerfect 5.1 "shell" disk with FY 95 Brief Project Description outline

cc: Jim Ayers

June Arkoulis-Sinclair Bob Spies

Outline of Information to Provide in FY 95 BRIEF PROJECT DESCRIPTIONS

A. Cover Page

- 1. **Project Title**
- 2. Name of Project Leader or Principle Investigator
- 3. Lead Agency, University or Organization (if known)
- 4. Cost of Project (for FY 95/future years, including reports, if known)
- 5. Project Start-up/Completion Dates (month/year)
- 6. **Project Duration (number of years)**
- 7. Geographic Area (locations where field work will be conducted)
- 8. Contact Person (name, address, phone)
- B. Introduction What You Propose as a Project
- C. Need for the Project Why the Project will Help Restoration
- D. Project Design Objectives, Methods, Schedule and Location
 - 1. Objectives
 - 2. Methods
 - 3. Schedule
 - 4. Technical Support
 - 5. Location
- E. Project Implementation Who Should Implement the Project
- F. Coordination of Integrated Research Effort
- G. Public Process
- H. Personnel Qualifications
- I. Budget
 - 1. personnel
 - 2. travel
 - 3. contractual services
 - 4. commodities
 - 5. equipment
 - 6. capital outlay
 - 7 general administration

Note: Specific guidance regarding the information that should be included in FY 95 Brief Project Descriptions is provided in the *Invitation to Submit Restoration Project Descriptions for Fiscal Year 1995.*

Exxon Valdez Oil Spill Trustee Council Restoration Office 645 "G" Street, Anchorage, AK 99501 Phone: (907) 278-8012 Fax: (907) 276-7178



May 19, 1994

Dear Interested Citizen:

The Exxon Valdez Oil Spill Trustee Council requests your help in preparing the restoration program for federal fiscal year 1995 (October 1, 1994 through September 30, 1995). Because of your interest in the program or scientific knowledge about the injuries caused by the spill, we have enclosed a copy of the Invitation to Submit Restoration Projects for Fiscal Year 1995. This document includes information about the types of restoration projects that the Trustee Council can fund under the terms of the court-approved settlement, and also identifies preliminary recommendations for 1995 research and monitoring priorities.

You can help the Trustee Council develop the restoration program for 1995 by:

- reviewing these recommendations and letting us know your priorities for 1995; and
- submitting your own project descriptions for the 1995 restoration program.

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The Trustee Council needs to receive your comments and project descriptions by June 15, 1994 if they are to be used in developing the Draft 1995 Work Plan.

During the summer, we will be evaluating the project descriptions we receive. A Draft 1995 Work Plan will be published for public review during August 1994, and funding decisions are expected to be made in late October. If you have any questions, please do not hesitate to contact Bob Loeffler, Veronica Gilbert, or Eric Myers from our office at the address on the letterhead. You may also call them toll free at 1-800-478-7745 (within Alaska) or 1-800-283-7745 (outside Alaska). Thank you for your interest.

Sincerely,

mela

Molly McCammon Director of Operations

Enclosure

Exxon Valdez Oil Spill Trustee Council Restoration Office 645 "G" Street, Anchorage, AK 99501

Phone: (907) 278-8012 Fax: (907) 276-7178

May 19, 1994

Dear Workshop Participant:

Please accept this long-delayed thank you for participating in the April 13-15, 1994 workshop concerning "Research Priorities for Restoration." We have been using the results of your work as preliminary guidance for the 1995 restoration program.

The enclosed *Invitation to Submit Restoration Projects* asks your further help in developing the restoration program for federal fiscal year 1995 (October 1, 1994 through September 30, 1995). You can help the Trustee Council develop the restoration program for 1995 by:

- reviewing these recommendations and letting us know your priorities for 1995; and
- submitting your own project description for the 1995 restoration program.

The Trustee Council needs to receive your comments and project description by June 15, 1994 if they are to be used in developing the Draft 1995 Work Plan.

Chapter 3 of the *Invitation to Submit Restoration Projects* synthesizes the workshop results to help guide the research and monitoring portion of the 1995 restoration program. Appendix A provides detail for each resource and service.

You will probably notice that there are some differences between the workshop results and the information in the enclosure. Some participants suggested changes in the Recovery Status and Recovery Objective for a resource or service. (These are outlined in Appendix A of the *Invitation*.) These had previously been subjected to independent peer review. Most of the recommended changes clarified these objectives, and thus are included in the appendix. Those that substantively changed previous scientific conclusions are not included in this document but are being deferred pending further peer review. In some cases, you will receive a call asking for further information about your recommendation. This review process will be accomplished during the next several months.

During the summer, we will be evaluating the project descriptions we receive. A Draft 1995 Work Plan will be published for public review during August 1994, and funding decisions are expected to be made in late October. If you have any questions, please do not hesitate to contact Bob Loeffler, Veronica Gilbert, or Eric Myers from our office at the address on the letterhead. You may also call them toll free at 1-800-478-7745 (within Alaska) or 1-800-283-7745 (outside Alaska). Thank you for your interest.

Sincerely,

Nolly Milamon

Molly McChmmon Director of Operations

Exxon Valdez Oil Spill Trustee Council Restoration Office 645 G Street, Suite 401, Anchorage, AK 99501-3451 Phone: (907) 278-8012 Fax: (907) 276-7178



MEMORANDUM

TO: Exxon Valdez Oil Spill Trustee Council

FROM: Molly McCammon, Director of Operations

DATE: May 19, 1994

SUBJ: Invitation to Submit Restoration Projects for Fiscal Year 1995

Please find attached a copy of the *Invitation to Submit Restoration Projects for Fiscal Year 1995.* The *Invitation* includes information about the types of restoration projects that the Trustee Council can fund under the terms of the civil settlement and also identifies some preliminary recommendations to help guide 1995 research, monitoring and general restoration project priorities. As you are aware, these preliminary recommendations were developed through a workshop process that included the Restoration Work Force, the Chief Scientist, federal and state agency biologists and resource managers, independent peer review scientists, user group representatives, members of the Public Advisory Group and spill area community residents.

This document has been widely distributed as an initial means of gathering brief project descriptions from state and federal agencies, university researchers, and private sector consultants as well as the general public for use in development of the Draft 1995 Work Plan. The brief project descriptions that are generated as a result of this solicitation will be reviewed by the Public Advisory Group and used to help formulate the Draft 1995 Work Plan in mid-August. The Draft 1995 Work Plan will then be subject to additional public review and comment.

Additional information will be provided regarding the 1995 Work Plan process at the May 31 Trustee Council meeting. In the meantime, if you would like additional copies of the *Invitation to Submit Restoration Projects* for Fiscal Year 1995, please let me know.

enclosure

Exxon Valdez Oil Spill Trustee Council Restoration Office 645 "G" Street, Anchorage, AK 99501 Phone: (907) 278-8012 Fax: (907) 276-7178 DECEIVED June 1, 1994 JUN 6 1994

Dear Potential Contractor EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL

The Exxon Valdez Oil Spiller Miller Council And Structures each year to restore the resources and services injured by the 1989 Exxon Valdez oil spill. The Trustee Council is seeking suggestions for use of the Restoration Fund for federal fiscal year 1995 (October 1, 1994 through September 30, 1995).

Invitation to Submit Project Descriptions. If you would like to suggest projects for 1995, please call and request a copy of the *Invitation to Submit Restoration Projects for Fiscal Year 1995* from the phone number on the letterhead. The *Invitation* explains the format and criteria for submitting projects. You may also call toll free at 1-800-478-7745 (within Alaska) or 1-800-283-7745 (outside Alaska). Project descriptions that we receive before June 15, 1994 will be evaluated for use in the 1995 restoration program. A Draft 1995 Work Plan will be published for public review during August 1994, and funding decisions are expected to be made in late October.

After the Trustee Council approves funding for 1995 projects in late October, some projects will be implemented by agencies, while others will be implemented using Requests for Proposals or other competitive solicitations. Ideas and project descriptions that you submit in response to the *Invitation to Submit Restoration Projects* may be used in developing Requests for Proposals after October.

Three Competitive Solicitations. In addition to the competitive procurements that will follow Trustee Council approval of 1995 restoration project funding in October, two limited competitive solicitations are being issued at this time to generate restoration project proposals for the Draft 1995 Work Plan. (These are being done on a limited, trial basis to determine the effectiveness of using competitive methods to *develop* project proposals as well as to *implement* them. Two solicitations for 1995 restoration projects, and a Request for Proposals for a 1994 project are described below.)

• Notice of Broad Agency Announcement. The National Oceanic and Atmospheric Administration is issuing a Broad Agency Announcement (BAA, FAC 90-4, Part 35) on behalf of the Trustee Council requesting research proposals on factors that may be influencing the recovery from the oil spill of one or more pelagic-feeding marine mammal or seabird species. These species have also been experiencing a long-term decline in the northern Gulf of Alaska and Prince William Sound. As part of investigations into possible food limitations,

State of Alaska: Departments of Fish & Game, Law, and Environmental Conservation United States: National Oceanic & Atmospheric Administration, Departments of Agriculture and Interior

12.6.5

Letter to Potential Contractors June 1, 1994 Page 2

> the agency is requesting research proposals concerning the energetic values of different prey — effects of diet composition on factors such as reproductive success, juvenile (or chick) survival and adult conditions.

> More information, including proposal requirements and evaluation criteria, is available in the Broad Agency Announcement. Interested parties should obtain copies of BAA #52ABNF-4-00104 directly from NOAA:

NOAA, WASC, Procurement Division, WC33 7600 Sand Point Way NE, Bin C15700 Seattle, WA 98115 (206) 526-6262

Questions should be directed to Heide Sickles (206) 526-6033. Proposals under this announcement are due June 30, 1994. Successful proposals will be included in the Draft 1995 Work Plan that will be published in mid-August 1994. A decision to approve or disapprove funding is not expected until the end of October 1994.

Notice of Expression of Interest. Unpriced Expressions of Interest are being solicited by the Alaska Department of Fish and Game using a two step sealed proposal process (AS 36.30.265) to investigate the role of disease and other factors in causing interannual mortalities of adult and subadult Pacific herring in Prince William Sound, Alaska, and the cumulative effects of these mortalities on the herring spawning population.

Interested parties may request a copy of the Expression of Interest Notice from:

Alaska Department of Fish and Game

Habitat and Restoration Division

333 Raspberry Road

Anchorage, Ak 99518-1599

Attention: Sheila Westfall (907) 267-2112

Proposals under this announcement are due <u>June 30, 1994</u>. Successful proposals will be included in the Draft 1995 Work Plan that will be published in mid-August 1994. A decision to approve or disapprove funding is not expected until the end of October 1994.

Letter to Potential Contractors June 1, 1994 Page 3

Request for Proposals (1994 Work Plan Project). Projects generated by the two competitive solicitations noticed above may become part of the 1995 restoration program. A Request for Proposals is currently available to implement a project approved as part of the 1994 program. A "Forage Fish Study in Prince William Sound, Alaska" RFP #52ABNF-4-00092, was advertised in the Commerce Business Daily on May 9, 1994. The RFP closes on June 8, 1994. Offerers interested in this project should request copies of the RFP directly from the NOAA procurement office:

NOAA, WASC, Procurement Division, WC33 7600 Sand Point Way NE, Bin C15700 Seattle, WA 98115 (206) 526-6262

Funds have already been approved for this project.

If have any additional questions, please call myself or ask for Bob Loeffler, Eric Myers, or Veronica Gilbert of the restoration staff at (907) 278-8012, or toll free at 1-800-478-7745 (within Alaska) or 1-800-283-7745 (outside Alaska). Thank you for your interest.

Sincerely,

Mally

Molly McCammon Director of Operations

State of Alaska: Departments of Fish & Game, Law, and Environmental Conservation United States: National Oceanic & Atmospheric Administration, Departments of Agriculture and Interior

NOMINATIONS FOR EXXON VALDEZ OIL SPILL PUBLIC ADVISORY GROUP

The *Exxon Valdez* Oil Spill Trustee Council is soliciting nominations for the Nov. 1994 – Oct. 1996 term of the Public Advisory Group. Members of the Public Advisory Group reflect balanced representation from the public at large and the following principal interests: aquaculture, commercial fishing, commercial tourism, environmental, conservation, forest products, local government, native landowners, recreational users, sport hunting and fishing, subsistence, and science/academic. Nominations will be accepted until August 1, 1994.

Nominations should include information requested in a packet available from the Trustee Council or the Oil Spill Public Information Center, both located at 645 G Street, Anchorage, Alaska 99501 or by calling 907/278-8008, toll-free at 1-800-478-7745 (within Alaska) or 1-800-283-7745 (outside Alaska).

For more detailed information on the role of the Public Advisory Group or the nomination process, or copies of documents relating to the Public Advisory Group, contact Doug Mutter, U.S. Department of the Interior, at 907/271-5011, or L.J. Evans at the Trustee Council office.

EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL ADMINISTRATIVE RECORD

EXXON VALDEZ OIL SPILL PUBLIC ADVISORY GROUP MEETING 9:30 AM, TUESDAY, JUNE 28 645 G STREET, ANCHORAGE

A meeting of the Exxon Valdez Oil Spill Public Advisory Group will take place on Tuesday, June 28, 1994, beginning at 9:30 AM at the Oil Spill Public Information Center, 645 G Street in Anchorage. The meeting is scheduled to continue on Wednesday, June 29, from 8:30 AM until noon. The public is welcome to attend.

- The agenda will include status reports on restoration activities and review of proposed 1995 Work Plan projects.
- There will be a public comment session on Tuesday, June 28 from 11:30 AM 12:15 PM.
- Persons needing a special modification in order to participate in this meeting should contact L.J. Evans or Carrie Holba at 278-8008 to make any necessary arrangements.
- For additional information contact Doug Mutter, U.S. Department of the Interior, at 907/271-5011.



EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL ADMINISTRATIVE RECORD

ECEIVE INVITATION TO SUBMIT RESTORATION PROJECTS JUL 2 6 1994 FOR FISCAL YEAR 1995 EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL ADMINISTRATIVE RECORD May 16, 1994

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Chapter 1

INTRODUCTION

The Excon Valdez Oil Spill Trustee Council funds activities each year to restore the resources and services injured by the 1989 Excon Valdez oil spill. The Trustee Council is now seeking projects for the use of the Restoration Fund during the period October 1, 1994 through September 30, 1995 (federal fiscal year 1995).

This document provides some preliminary recommendations for the 1995 restoration program. You can help the Trustee Council develop the restoration program for 1995 by:

- reviewing the recommendations and letting us know your priorities for 1995; and
- submitting your own projects for the 1995 restoration program.

The research and monitoring recommendations in this document were developed at a workshop held April 13-15, 1994 in Anchorage. Over seventy participants, including scientists familiar with the spill and members of the public, worked together to prioritize research and monitoring questions. While the recommendations are preliminary and will be subject to further scientific, legal, and policy review, they currently provide the best indication of 1995 research and monitoring needs. The workshops are an important step in developing an adaptive management process for synthesizing and integrating restoration results to guide the restoration program. The information will be further reviewed and refined this year, and will be updated at least annually to ensure that guidance for the restoration program remains current.

Since the workshop focused on research and monitoring issues, few general restoration activities were identified. Trustee Council staff is working with scientists to review general restoration ideas submitted in previous years to identify projects for 1995. In addition, we are hoping that other effective general restoration projects will be submitted in response to this Invitation to Submit Restoration Projects for Fiscal Year 1995.

The Trustee Council needs to receive your comments and restoration projects by June 15, 1994 if they are to be used in developing a draft 1995 restoration program.

Please use the information in this document to help you submit projects for restoration funding. Projects should conform to the ecosystem-based, balanced approach to restoration explained in this document. Chapter 2 explains how you can submit projects to the Trustee Council. Chapter 3 provides the preliminary monitoring and research recommendations. Chapter 4 discusses important general restoration projects. Appendix A summarizes information and preliminary recommendations for each injured resource and service. Appendix B lists 1994 restoration projects funded by the Trustee Council, and Appendix C lists participants in the April 1994 workshop that developed the monitoring and research recommendations.

Background -

In 1991, the U.S. District Court approved a settlement of a lawsuit concerning the 1989 *Exxon Valdez* oil spill. The terms of the civil settlement required Exxon to pay the United States and the State of Alaska \$900 million over ten years to restore the resources injured by the spill, and the reduced or lost services (human uses) they provide. Under the court-approved terms of the settlement, a Trustee Council of three federal and three state members was designated to administer the restoration fund and to restore the resources and services injured by the spill. According to the terms of the settlement:

- Restoration funds must be used "... for the purposes of restoring, replacing, enhancing or acquiring the equivalent of natural resources injured as a result of the Oil Spill or the reduced or lost services provided by such resources..."
- Restoration funds must be spent on restoration of natural resources in Alaska unless the Trustee Council unanimously agrees that spending funds outside of the state is necessary for effective restoration.
- All decisions made by the Trustees, such as a decision to spend restoration funds, must be made by unanimous consent.

A Comprehensive, Balanced Approach to Restoration

Since the 1991 settlement, the Trustee Council has been working to restore the resources and services injured by the oil spill. In November 1993, a *Draft Restoration Plan* was released to guide the restoration effort. A Draft Environmental Impact Statement is currently being written on the *Draft Restoration Plan*. The *Draft Restoration Plan* and Draft Environmental Impact Statement will be distributed for public review June 18 through August 1, 1994. A decision to adopt a Final Restoration Plan and Final Environmental Impact Statement will be made at the end of October 1994. To be eligible for funding, projects must be consistent with the Final Restoration Plan. Until the Final Restoration Plan is adopted, the Trustee Council will use the information in the *Draft Restoration Plan* to help select projects for funding.

The *Draft Restoration Plan* outlines a comprehensive, balanced approach to the restoration of damaged resources and services. This approach includes the following basic elements:

- Monitoring and Research;
- General Restoration; and
- Habitat Acquisition and Protection.

Monitoring and Research includes gathering information about how resources and services are recovering, whether restoration activities are successful and what continuing

problems may be constraining recovery of injured resources. This information is necessary to help resource managers and the Trustee Council restore the injured resources and services.

General Restoration includes a wide variety of restoration activities. Some General Restoration activities improve the rate of natural recovery by directly manipulating the environment. Other activities protect natural recovery by managing human uses or reducing marine pollution. A few general restoration activities may involve facilities. Facilities may direct human use away from sensitive areas, support other restoration activities, or replace facilities needed for access and damaged by the spill.

Habitat Acquisition and Protection includes the purchase of private land or interests in land in order to minimize further injury to resources and services and allow recovery to continue unimpeded. It may also include recommendations for changes in agency management practices on existing public land in the spill area. Habitat protection and acquisition is not the subject of this invitation. Decisions about habitat protection and acquisition are being addressed through a separate process. For more information on this subject see "Other Restoration Activities and Funding Sources" on page 7.

The Trustee Council's effort to develop a balanced approach to restoration is shown in Figure 1. This illustration also recognizes the establishment of a Restoration Reserve, initially authorized by the Trustee Council in January 1994, to provide for long-term restoration funding beyond the time when Exxon makes its final settlement payment in the year 2001.



Figure 1. Major Elements of the Restoration Program

Schedule for 1995 Funding Decisions

Approximately \$17 million of monitoring, research, and general restoration projects were funded in fiscal year 1994. It is likely that a comparable amount will be funded in 1995. In any case, it is likely there will be many more useful restoration projects than there is money available to fund them in fiscal year 1995. Please review this document carefully before submitting a project.

Projects received from the public and from agencies by June 15, 1994 will be subject to independent scientific review as well as examined by the Trustee Council's Public Advisory Group, a 15-member advisory group representing a cross-section of interest groups affected by the spill. The Trustee Council staff will use the recommendations of the independent scientific review, the Public Advisory Group, and agency staff to compile a draft that describes projects proposed for funding in 1995. That document, the Draft 1995 Work Plan, will be published in August 1994 and will be available for public review and comment until the end of September 1994. It will describe restoration projects proposed for funding how much they will cost, how they will help restore the resources and services injured by the spill, and whether they will be conducted by a state or federal agency, or whether competitive proposals will be solicited from non-trustee agencies to implement the project.

The public will have a chance to read the Draft 1995 Work Plan and advise the Trustee Council about which proposed restoration projects should be funded. Using these public comments, along with recommendations of independent scientists and the Public Advisory Group, it is anticipated that at the end of October 1994, the Trustee Council will decide upon the Final 1995 Work Plan. Unanimous agreement of all six state and federal Trustee Council members is required to fund a project.

Resources and Services Injured by the Spill

Under the terms of the court-approved Settlement, the Trustee Council may only use restoration funds

"... for the purposes of restoring, replacing, enhancing, or acquiring the equivalent of natural resources injured as a result of the Oil Spill and the reduced or lost services provided by such resources...."

Table 1 lists the resources and services injured by the spill. The table includes those resources for which scientific research has demonstrated a population-level injury, or sublethal or chronic effect.

Only restoration projects that are designed to restore the resources or services identified in Table 1 will be evaluated for 1995 unless new scientific or local knowledge shows that other resources or services experienced a population-level injury or continuing chronic effect. In addition, restoration actions may address resources not listed in Table 1 if these activities will benefit an injured resource or service. For example, it may be permissible to focus activities on a resource that is not listed in Table 1 if it will help subsistence or commercial fishing, or if it is a necessary part of a research project designed to help understand the injuries to a resource identified in the table.

IN	T of at Podyood							
Biological	Resources	Other	SERVICES					
Recovering Bald eagle Black oystercatcher Intertidal organisms (some) Killer whale Sockeye salmon (Red Lake) Subtidal organisms (some)	Not Recovering Common murre Harbor seal Harlequin duck Intertidal org. (some) Marbled murrelet Pacific herring Pigeon guillemot Pink salmon Sea otter Sockeye salmon (Kenai & Akalura systems) Subtidal organisms (some)	Archaeological resources Designated wilderness areas	Commercial fishing Passive uses Recreation and Tourism including sport fishing, sport hunting, and other recreation uses Subsistence					
Recovery Unknown Clams Cutthroat trout Dolly Varden River otter Rockfish		· · · · · · · · · · · · · · · · · · ·						

 Table 1. Resources and Services Injured by the Spill

 The table includes only population-level and continuing sublethal injuries

The table's list of injured resources reflects an understanding of spill-related injury prior to results being available from the 1993 field season, and it is likely to change over time. New information indicating that additional resources or services sustained injuries, or that the recovery status of a resource or service changed will be considered by the Trustee Council. If confirmed, changes will be made to the list of injured resources and services.

Competitive Solicitation for Restoration Projects

After the Trustee Council approves funding for 1995 projects in late October, some projects will be implemented by agencies, while others will be implemented using Requests for Proposals or other competitive solicitations. Ideas and project descriptions that you submit in response to this *Invitation to Submit Restoration Projects* may be used

in developing Requests for Proposals after October.

In addition to the competitive procurements that will follow Trustee Council approval of 1995 restoration project funding in October, two limited competitive solicitations are being issued at this time to generate restoration project proposals for the Draft 1995 Work Plan. (These are being done on a limited, trial basis to determine the effectiveness of using competitive methods to *develop* project proposals as well as to *implement* them. Two solicitations for 1995 restoration projects, and a Request for Proposals for a 1994 project are described below.)

Notice of Broad Agency Announcement. The National Oceanic and Atmospheric Administration is issuing a Broad Agency Announcement (BAA, FAC 90-4, Part 35) on behalf of the Trustee Council requesting research proposals on factors that may be influencing the recovery from the oil spill of one or more pelagic-feeding marine mammal or seabird species. These species have also been experiencing a long-term decline in the northern Gulf of Alaska and Prince William Sound. As part of investigations into possible food limitations, the agency is requesting research proposals concerning the energetic values of different prey — effects of diet composition on factors such as reproductive success, juvenile (or chick) survival and adult conditions. (For related information concerning this research question, see Priority Ecosystem Issue #2, page 24).

More information, including proposal requirements and evaluation criteria, is available in the Broad Agency Announcement. Interested parties should obtain copies of BAA #52ABNF-4-00104 directly from NOAA:

NOAA, WASC, Procurement Division, WC33 7600 Sand Point Way NE, Bin C15700 Seattle, WA 98115 (206) 526-6262

Questions should be directed to Heide Sickles (206) 526-6033. Proposals under this announcement are due <u>June 30, 1994</u>. Successful proposals will be included in the Draft 1995 Work Plan that will be published in mid-August 1994. A decision to approve or disapprove funding is not expected until the end of October 1994.

Notice of Request for Proposals. Unpriced technical offers are being solicited by the Alaska Department of Fish and Game using a multi-step sealed proposal (AS 36.30.265) to investigate the role of disease in causing interannual mortalities of adult and subadult Pacific herring in Prince William Sound, Alaska, and the cumulative effects of these mortalities on the herring spawning population. (For related information concerning this research question, see "Is it Disease" on page 32.)

Interested parties should obtain copies of the Request for Proposals from:

Alaska Department of Fish and Game Habitat and Restoration Division 333 Raspberry Road Anchorage, Alaska 99518-1599 Attention: Sheila Westfall (907) 267-2112 Proposals under this announcement are due <u>June 30, 1994</u>. Successful proposals will be included in the Draft 1995 Work Plan that will be published in mid-August 1994. A decision to approve or disapprove funding is not expected until the end of October 1994.

Request for Proposals (1994 Work Plan Project). Projects generated by the two competitive solicitations noticed above may become part of the 1995 restoration program. A Request for Proposals is currently available to implement a project approved as part of the 1994 program. A "Forage Fish Study in Prince William Sound, Alaska" RFP #52ABNF-4-00092, was advertised in the Commerce Business Daily on May 9, 1994. The RFP closes on June 8, 1994. Offerers interested in this project should request copies of the RFP directly from the NOAA procurement office:

NOAA, WASC, Procurement Division, WC33

7600 Sand Point Way NE, Bin C15700

Seattle, WA 98115

(206) 526-6262

Funds have already been approved for this project.

Other Restoration Activities and Funding Sources

Subsistence. On April 11, 1994, the Trustee Council approved a new project for subsistence restoration planning and implementation. During June, the Alaska Department of Fish and Game, the Alaska Department of Community and Regional Affairs, the U.S. Department of the Interior, and the U.S. Forest Service will be helping subsistence communities and users develop a prioritized list of subsistence projects for consideration in the Draft 1995 Work Plan.

Projects that are not funded by the Trustee Council as part of the 1995 Work Plan may be eligible for funding from \$5 million appropriated by the Alaska legislature from the *Exxon Valdez* criminal settlement. That appropriation is for grants to unincorporated rural communities in the oil spill area to restore, replace, or enhance subsistence resources or services damaged or lost as a result of the spill. The legislation requires that selection of grant recipients be made after consultation with the state members of the Trustee Council. To ensure that subsistence recommendations are consistent and reflect the priorities of subsistence users, subsistence projects submitted as part of this *Invitation to Submit Restoration Projects* will be referred to the subsistence planning project coordinators at the Alaska Department of Fish and Game. For more information concerning subsistence restoration planning efforts, please call Jim Fall or Rita Miraglia, Alaska Department of Fish and Game at (907) 267-2353.

Recreation. In addition to the appropriation for subsistence restoration, the 1993 Alaska Legislature appropriated funds from the *Exxon Valdez* criminal settlement, plus interest on the criminal settlement, for a total of approximately \$8 million to the Alaska Department of Natural Resources for "the construction or placement, within Prince William Sound, the southern Kenai Peninsula, and the coastal areas of the Kodiak Archipelago, of recreational amenities, including recreational cabins, trails, mooring buoys, floating docks and similar items, and the acquisition of sites and access rights for such amenities, that restore or enhance recreational services lost or diminished by the *Excon Valdez* oil spill."

Earlier this year, the Department of Natural Resources established the Marine Recreation Project to administer these funds. In June, the Department will issue an invitation to the public to submit suggestions for recreation restoration projects. For more information concerning recreation restoration through the Marine Recreation Project, please call Ron Crenshaw at (907) 762-2613.

Those submitting recreation projects in response to this *Invitation to Submit Restoration Projects* will also be contacted by the Department of Natural Resources to see if they would be interested in having the project considered for funding under the Marine Recreation Project. However, the Marine Recreation Project may have different criteria and submission requirements than those described in this information packet.

Archaeology. In January 1994, the Trustee Council approved Project 94007, "Community Archaeological Site Protection Plans," with the Office of History and Archaeology, State of Alaska, as project leader. These plans will address such topics as stabilizing eroding sites, removing and restoring artifacts, the reduction of looting and vandalism, the removal of artifacts from sites and storage in an appropriate facility, or affording the opportunity to view or learn about the cultural heritage of people in the spill area. For more information about community Archaeological Site Protection Plans and how they might affect your proposal, please call Doug Reger at (907) 762-2636.

Habitat Protection and Acquisition. This Invitation to Submit Restoration Projects asks for monitoring, research, and general restoration projects. Please do not use the format in Chapter 2 to suggest parcels for habitat protection and acquisition. An evaluation of parcels in the spill area greater than 1,000 acres was completed last year, and the Trustee Council is currently asking landowners to nominate small parcels in the spill area, those less than 1,000 acres, for evaluation and possible protection. Landowners wishing to nominate small parcels for protection should obtain the Small Parcel Nomination Packet (May 1994). That document is available by calling (907) 278-8012, or toll free within Alaska 1-800-478-7745, or from outside Alaska 1-800-283-7745. Nominations must be received by July 15, 1994.

Where to Get more Information

The *Draft Restoration Plan*, adopted November 30, 1993 by the Trustee Council, contains criteria and definitions for different types of restoration projects. It also explains the terms of the settlement and the funding schedule, and it provides other information about the restoration program that is not in this *Invitation to Submit Restoration Projects*.

A Draft Environmental Impact Statement currently is being written on the *Draft Restoration Plan*. The *Draft Restoration Plan* and Draft Environmental Impact Statement will be distributed for public review June 18 through August 1, 1994. A decision to adopt a Final Restoration Plan and Final Environmental Impact Statement will be made at the end of October 1994. To be eligible for funding, projects must be consistent with the Final Restoration Plan. Until the Final Restoration Plan is adopted, the Trustee Council will use the information in the *Draft Restoration Plan* to help select projects for the Draft Work Plan.

To receive a copy of the *Draft Restoration Plan*, the Draft Environmental Impact Statement, or the *Small Parcel Nomination Packet*, please call the *Exxon Valdez* Restoration Office at (907) 278-8012 (toll free within Alaska at 1-800-478-7745, or from outside Alaska at 1-800-283-7745).

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Chapter 2

HOW TO SUBMIT A RESTORATION PROJECT

This chapter describes the type of information the Trustee Council needs in order to evaluate the projects suggested for the Draft 1995 Work Plan that will be published in mid-August. The Draft 1995 Work Plan includes the period October 1, 1994 through September 30, 1995 (federal fiscal year 1995).

Please use the guidance in this chapter to describe your research, monitoring, or general restoration project and include the most complete information you can — the more information you provide, the easier it will be for the Trustee Council to evaluate your project. A specific outline of information needed is provided below. At a minimum, it is essential to describe the project and to clearly show how a proposed project will help restore an injured resource or service.

As noted in Chapter 1, Habitat Protection and Acquisition is not the subject of this *Invitation to Submit Restoration Projects*. For more information regarding the Trustee Council's habitat evaluation and protection process, please call the *Exxon Valdez* Restoration Office at (907) 278-8012 (toll free within Alaska at 1-800-478-7745, or from outside Alaska at 1-800-283-7745).

To ensure that your project is considered for the Draft 1995 Work Plan, please provide a brief written description of your project to the Anchorage Restoration Office (645 G Street, Anchorage, Alaska, 99501) by June 15, 1994. Please note that information included in project descriptions are public information and may be used in the development of competitive Requests for Proposals (RFPs) at a later time in the work plan process.

Your project description should answer four basic questions:

- WHAT is the project that you are proposing?
- WHY will the project help accomplish restoration?
- HOW should the project be implemented?
- WHO should implement the project?

In general, the project descriptions should be approximately 3 - 5 pages in length, although more information can be provided if you think it will help explain your project. As you prepare the description, you may wish to provide information concerning the project as it relates to the Draft Guiding Principles. (See page 15.) It would be most helpful to have your project description submitted in an electronic, as well as printed, form. A pre-formatted, IBM-compatible disk (WordPerfect 5.1) is available upon request.

Guidelines for Preparing Brief Project Descriptions

A. Cover Page

A cover page should be provided that contains the following information:

- 1. Project Title
- 2. Name of Project Leader or Principal Investigator (if known)
- 3. Lead Agency, University or Organization (if known)
- 4. Cost of Project (for FY 95 and future years, including the cost of writing the FY 95 report, if known)
- 5. Project Start-up/Completion Dates (month/year, if known)
- 6. Project Duration (number of years, if known)
- 7. Geographic Area (locations where field work will be conducted, if known)
- 8. Contact Person (name, address, phone number for further project information)

With respect to Project Duration, long-term projects can frequently be broken into smaller increments. The Trustee Council needs to know the minimum number of years that a project can be funded in order to achieve useful results. If you believe a project should not be funded unless the work can be supported for a number of years, that information should be provided.

B. Introduction — What You Propose as a Project

A basic statement should be provided that describes what you propose as a restoration project. This statement should identify the injured resources and services that the project would address. (See Table 1 on page 5.) Identify specific accomplishments that would result from implementation of the project. Finally, if you know that the Trustee Council has previously funded work in this area, or if the project is a continuation of prior efforts, please include that information.

C. Need for the Project — Why the Project will Help Restoration

This section should identify why the proposed project would help restore one or more injured resource or service. A clear statement of why the proposed project will contribute to the recovery of an injured resource or service is essential to ensure that the project is eligible for funding under the terms of the court-approved civil settlement. The recovery status and objectives for each resource are listed in Appendix A. This information is useful in describing the current condition of the resource and the condition that restoration is trying to achieve. Your information should explain how the proposed project will help take the resource from its present condition to its restoration objective.

D. Project Design — Objectives, Methods, Schedule and Location

This section should identify specific objectives (tasks) that would be undertaken as part of the project. To the extent that you know the project methodology, it should be included here. Describe methods that would be used to implement the project (for example, a discussion of the survey method or sampling technique proposed for use to monitor recovery of a particular species), as well as technical support or services that may be necessary (e.g., computer services, lab analysis, data archiving, etc.). Information on each of the following would be helpful:

- 1. Objectives: Identify specific, measurable project objectives (tasks).
- 2. Methods: Describe proposed methods in general terms. While extensive technical detail is not needed, specific information will make it possible to more effectively evaluate suggested projects.
- 3. Schedule: Identify dates (month/year) for project activities including, at a minimum, field work, sampling events, data compilation and analysis, major contract deliverables, opportunities for public involvement and report submissions.
- 4. **Technical Support:** Identify technical support necessary to complete the project (e.g., computer services, laboratory analysis, data archiving, etc.).
- 5. Location: Identify where the project will be undertaken, including areas or communities that may be affected by the project.

E. Project Implementation — Who Should Implement the Project

The Trustee Council must decide whether each project should be implemented by a state or federal agency, through a competitive procurement process, or through a combination of the two. Please provide information that would assist the Trustee Council in making this decision.

If known, identify the agency, organization or other entity that would implement the project. Identify what portion of the project, if any, would be appropriate to implement through a competitive contract process. If project implementation is proposed for a designated state agency, federal agency, or a university, please explain why that entity is appropriate to implement the project (for example, if the entity has unique technical expertise or there are legal resource management mandates that require that the project be implemented by a government agency).

F. Coordination of Integrated Research Effort

Multi-disciplinary, interagency or collaborative partnerships to implement projects are encouraged. Describe how the project will be coordinated or integrated with any related projects proposed for fiscal year 1995.

G. Public Process

Discuss what efforts have been, or will be, made to involve the public in development or implementation of the project and what further opportunity there will be for public involvement (e.g., workshops, meetings, document reviews, etc.).

H. Personnel Qualifications

Include a statement on the qualifications of each of the key project personnel. Include relevant background information and noteworthy experience such as published work on similar or related projects.

I. Budget

Provide a fiscal year 1995 summary budget for the proposed project that identifies estimated costs for each of the following, including the cost of preparing reports: (1) personnel, (2) travel, (3) contractual services, (4) commodities, (5) equipment, (6) capital outlay, (7) general administration (including environmental compliance).

The budget should reflect the fiscal year 1995 work including the cost to prepare a final report. That is, a project cost estimate should reflect the cost of any needed data analysis or report preparation, even if that cost would be incurred after September 30, 1995 (the end of the federal fiscal year). In addition, please include in the budget the cost of two trips to Anchorage and seven days time for the principal investigators. That time will be used for winter workshops to discuss the results of the 1994 field season and make any adjustments for 1995.

If you have questions concerning what should be included in the brief project description, or would like to obtain a pre-formatted, IBM-compatible disk (WordPerfect 5.1), please call the *Exxon Valdez* Restoration Office at (907) 278-8012 (toll free within Alaska 1-800-478-7745, or from outside Alaska at 1-800-283-7745). The fax number is 907-276-7178.

Draft Guiding Principles

In mid-January, in mid-March, and then again in mid-April 1994, a working group of state and federal resource specialists, peer review scientists, representatives of the Trustee Council's Public Advisory Group, representatives of user groups impacted by the spill and residents of the spill-affected communities met in a series of work sessions to discuss methods to implement an ecosystem approach to restoration activities.

The working group developed the Draft Guiding Principles identified below which reflect and elaborate upon the Policies identified in Chapter 2 of the *Draft Restoration Plan*. Further guidance regarding the categories of restoration action — General Restoration, Habitat Protection and Acquisition, Monitoring and Research, and Public Information and Administration — is provided in Chapter 3 of the *Draft Restoration Plan*.

General Principles

- 1. Restoration should contribute to a healthy, productive and biologically diverse ecosystem within the spill area that supports the services necessary for the people who live in the area.
- 2. Restoration will take an ecosystem approach to better understand what factors control the populations of injured resources.

Principles that Focus or Direct Restoration Activities

- 3. Restoration will focus upon injured resources and services and will emphasize resources and services that have not recovered. Resources and services will be enhanced, as appropriate, to promote restoration. Restoration actions may address resources for which there was no documented injury if these activities will benefit an injured resource or service.
- 4. Resources and services not previously identified as injured may be considered for restoration if reasonable scientific or local knowledge obtained since the spill indicates a spill-related injury.
- 5. Projects designed to restore or enhance an injured service:
 - must have a sufficient relationship to an injured resource,
 - must benefit the same user group that was injured, and
 - should be compatible with the character and public uses of the area.
- 6. Restoration activities will occur primarily within the spill area. Limited restoration activities outside the spill area, but within Alaska, may be considered under the following conditions:
 - when the most effective restoration actions for an injured population are in a part of its range outside the spill area, or
 - when the information acquired from research and monitoring activities outside the spill area will be significant for restoration or understanding injuries within the spill area.

Principles Concerning Integration of Restoration Activities

- 7. Restoration will include a synthesis of findings and results, and will also provide an indication of important remaining issues or gaps in knowledge.
- 8. Restoration shall take advantage of cost-sharing opportunities where effective.
- 9. Restoration should be guided and reevaluated as information is obtained from damage assessment studies and restoration actions.

Public Participation Principles

- 10. Restoration must include a meaningful public participation process at all levels: planning, project design, implementation, and review.
- 11. Restoration must reflect public ownership of the process by timely release and reasonable access to information and data.

Principles Concerning the Design of Restoration Projects

- 12. Proposed restoration strategies should state a clear, measurable and achievable endpoint.
- 13. Restoration must be conducted as efficiently as possible, reflecting a reasonable balance between costs and benefits.

Principles to Help Establish Priorities for Restoration Activities

- 14. Priority will be given to restoring injured resources and services which have economic, cultural and subsistence value to people living in the oil spill area, as long as this is consistent with other principles.
- 15. Possible negative effects on resources or services must be assessed in considering restoration projects.
- 16. Priority shall be given to strategies that involve multi-disciplinary, interagency or collaborative partnerships.
- 17. Restoration projects will be subject to open, independent scientific review before Trustee Council approval.
- 18. Past performance of the project team should be taken into consideration when making funding decisions on future restoration projects.
- 19. Competitive proposals for restoration projects will be encouraged.
- 20. Government agencies will be funded only for restoration projects that they would not have conducted had the spill not occurred.

One Final Note...

The Trustee Council can fund only those projects that are consistent with the terms of the court approved Consent Decree that established the Restoration Fund, and that are not prohibited by law, regulation, executive order, or other requirement. For additional information, please refer to the *Draft Restoration Plan*.

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Chapter 3

PRELIMINARY RESEARCH AND MONITORING STRATEGIES FOR FISCAL YEAR 1995

This chapter includes preliminary recommendations for research and monitoring needs to answer two important questions for the restoration program:

- Are the injured resources recovering? (Monitoring)
- If not, why not? (Research)

To use information gained over the five years since the spill, and to prioritize opportunities for research and monitoring, the Trustee Council sponsored a workshop on April 13-15, 1994 in Anchorage, Alaska. The workshop had approximately seventy participants, including scientists and members of the public who are familiar with the status and biology of each resource, or who have a particular concern about the resource. (A participant list is in Appendix C.) Participants were asked to identify and prioritize research and monitoring needs for 1995. While the recommendations are preliminary and will be subject to further scientific, legal, and policy review, they currently provide the best indication of 1995 research and monitoring needs.

Unless changed by further review, the research and monitoring areas identified as "high priority" areas are the most likely to receive funding in fiscal year 1995. However, all projects will be individually evaluated for their ability to contribute to restoration.

These recommendations are presented to help guide the submission of restoration projects. (See project format in Chapter 2.) Please let us know if you have any comments about the recommendations themselves, or about how they could be revised or strengthened.

Definitions

Research and monitoring projects should conform to the following definitions.

Research. An eligible research project provides information needed to restore an injured resource or service. This may include information about key relationships in the ecosystem that are important for one or more injured resource or service. For example, understanding problems with food sources, habitat requirements, and other ecosystem relationships of an injured resource or service will provide information for more effective restoration and management. A project may include research to determine why an injured resource is not

recovering. It may also include long-term monitoring of an ecosystem relationship that provides an important understanding for restoration of one or more injured resource. Research that is not related to a restoration problem is not eligible for funding.

Monitoring. Information about recovery is important in designing restoration activities, and determining which activities deserve funding. An eligible recovery monitoring project tracks the rate and degree of recovery of the resources and services injured by the spill. It may also determine when recovery has occurred. For resources that are already recovering, it may detect reversals or problems with recovery. For resources that are not recovering, recovery monitoring may determine the status of the injury, whether it is worsening, and when the population stabilizes or recovery begins.

Recovery Monitoring Strategies

This section of the chapter summarizes recommendations concerning monitoring the recovery of injured resources and services. For each injured resource and service, Table 2 identifies its recovery status, and very briefly describes the type of recovery monitoring strategy required (boat surveys, growth rates, etc.). In addition, Table 2 forecasts the needed monitoring schedule through 2001, the end of the settlement period. The monitoring needs and schedule will be subject to statistical analysis and further scientific review. It is still being evaluated by the Trustee Council and is likely to be revised.

More detail is given about the recovery monitoring strategy for each injured resource and service in Appendix A.

Resource	Recovery Status	Description and Frequency (years)	1995	1996 -	1997	1998	1999	2000	2001	Beyond
Marine Mammals Harbor Seals	Not Recovering	Trend counts, 1 yrs	۲	۲	?					
Killer Whales	Recovering	Photo-id, 2 yrs	. ()		۲		۲		۲	?
Sea Otters	Not Recovering	Aerial surveys, 2 yr Carcass collect'n, 1 yr	۲ ۲	ُ چ	•	?				
Terrestrial Mammals River Otters	Unknown	Latrine surveys, 1 yr	۲	?	м.				÷	-
Birds Bald Eagles	Recovering	Population survey, 5yrs	۲					۲		
Black Oystercatchers	Recovering	Boat survey, 3 yrs	•			۲			۲	?
Common Murres	Not Recovering	Population survey, 3 yrs Productivity survey, 1 yr	۲	ی ک	۲	۲	* *	?		۲
Harlequin Ducks	Not Recovering	Population survey, 3 yrs Productivity survey, 1 yr	8 8	ø	۲	* *	۲	?	۲	?
Marbled Murrelets	Not Recovering	Boat survey, 3 yrs		۲			. 😁			?
Pigeon Guillemots	Not Recovering	Boat survey, 3 yrs Naked Is. counts, 3 yrs		(E) (D)	-		(*) (*)			??
Fish & Shellfish Cutthroat & Dolly Varden Trout	Unknown	Growth rates, 3 yrs	۲			B			?	
Pacific Herring	Not Recovering	Health & spawning bio- mass counts, 1 yr		•	æ	۲	۲	۲	?	
Pink Salmon	Not Recovering	Egg mortality, 1 yr Returns per spawner, 1yr	(*) (*)	() ()	- -	??				
Rockfish	Unknown	None								

Table 2. Draft Recovery Monitoring Strategies and Frequencies

🤌 Resource 🛼	Recovery Status	 Description and Frequency (years) 	1995	1996	1997	1 998	1999	2000	2001	Beyond
Sockeye Salmon Kenai River Red Lake	Not Recovering	Fry abundance, 1 yr Smolt outmigration, 1 yr Smolt outmigration, 1 yr	*	* *	• • ?	3 ©	•	•	•	? ?
Akalura Lake	Not Recovering	Smolt outmigration, 1 yr	۲	•	۲	۲	۲	۲	۲	?
Other Resources Archaeology	Nonrenewable	Index sites, 1 yr Cross-check sites, 2 yrs	•	•	9) 19	۲			? ?	
Intertidal Organisms	Some Recovering Some Not Rec.	PWS ¹ sites, 2 yrs GOA ² sites, 2 yrs Herring Bay, 1 yr	•	(# (#	• ?	, ®	?	, ?		1
Persistence of Oil Shorelines Mussel Beds Subtidal	Recovering Not Recovering Recovering	Shoreline Assess, 1 yr Sediment oil, 3 yrs Hydrocarbons, Bile, ?	KAP ³ 1/3	PWS ¹ 1/3 ?	? 1/3	?				
Services Commercial Fishing	Not Recovering	See specific resources			-					
Designated Wilder- ness Areas	Unknown	See persistence of oil								
Passive Use	Unknown	See specific resources								
Recreation and Tourism	Unknown	Beach use surveys, 1 yr Customer survey, 3 yrs	*	•	۲	• •	۲	۲	•	?
Subsistence	Recovering	See specific resources								

¹ PWS = Prince William Sound; ² GOA = Gulf of Alaska; ³ KAP = Kodiak and Alaska Peninsula.
Research Strategies

Five years after the oil spill, some resources are not recovering, while others are recovering only slowly. For these resources, restoration requires an understanding of the factors constraining recovery: Why aren't these resources recovering? If they are recovering only slowly, why? Without answers to these questions, restoration efforts may be ineffective.

The resources injured by the spill that are not recovering are listed below. This list will change as more information becomes available. (See Table 1 in Chapter 1 for a more complete list of resources and services injured by the spill.)

common murre harbor seal harlequin duck marbled murrelet Pacific herring pigeon guillemot pink salmon sea otter sockeye salmon some intertidal resources some subtidal resources

In some cases, the factors constraining recovery can be investigated or understood in isolation. However, the Trustees have recognized that a resource-specific approach is not always adequate — that restoration must often take an **ecosystem approach** to better understand what factors control the populations of injured resources. Understanding why specific injured resources are not recovering will require a better understanding of how these resources interact with and are influenced by ecosystem processes. The ecosystem approach will require multi-disciplinary, long-term research on ecosystem processes that may be limiting recovery, in addition to resource-specific research projects.

This chapter first explains priority ecosystem issues recommended by the April workshop. It is followed by a more detailed discussion of how individual factors may be constraining recovery of injured resources.

Priority Ecosystem Issues

This section describes high priority research questions to help establish an integrated understanding of ecosystem processes that may be constraining recovery. Some of these processes were changed by the spill, and others are changing due to other causes. An understanding of both the spill-induced and natural causes that may be limiting recovery is important to restoration. Because ecosystem processes are complex and may involve multiple resources, restoration projects to address these questions involve an integrated, collaborative, multi-disciplinary approach.

The April workshop (see page 19) identified five high priority ecosystem issues: two issues occur in the pelagic (offshore) ecosystem, two in the nearshore ecosystem, and one in the uplands. These are explained on the next few pages (not in any order of priority).

1. Prince William Sound System Investigation — What is causing the failure of Prince William Sound herring and pink salmon runs? This project was funded in 1994 as Project 94320 and is a good example of the type of integration necessary to address pelagic ecosystem issues. It integrates the investigations of various ecosystem processes as they relate to the survival of juvenile salmon and herring. The project seeks to test the hypothesis that the mortality and growth of pink salmon and herring in Prince William Sound are substantially influenced by the standing biomass of zooplankton, as influenced by physical and oceanographic features. Its investigations seek to measure whether average residence time of the Sound's waters within Prince William Sound, and the strength of advective transport of deeper waters from the Gulf of Alaska into the Sound, control the standing biomass of zooplankton. The project postulates that when zooplankton are abundant, predation pressure on juvenile salmon and herring is relatively low, and the survival of the juveniles is higher. If zooplankton abundance is low, predatory fish and birds switch from a zooplankton diet to juvenile salmon and herring, thus reducing survival of the juveniles.

2. What is causing the long-term decline in some marine mammals and seabirds? Since the mid-1970s, a variety of marine mammals and seabirds that feed in pelagic areas have been declining in the northern Gulf of Alaska and Prince William Sound. These include harbor seals, marbled murrelets, and pigeon guillemots as well as sea lions and kittiwakes. In contrast, resources using nearshore habitats, such as sea otters and sea ducks, appear to have been stable or increasing during the same time period. This has led biologists to think that differences inherent in the food webs of these declining species may be responsible for differing trends. However, the mechanisms of the declines are unknown. In the case of seals, it may be poor juvenile survival. In the case of seabirds, it may be poor survival of chicks.

More specific information is needed about the composition of the diet of marine mammals and seabirds; seasonal and annual variability in diet; age-specific differences in diet; and the energetic values of different prey — effects of diet composition on factors such as reproductive success, juvenile (or chick) survival, and adult condition. In addition, information is needed on non-commercial forage species (particularly forage fish, macrozooplankton, and squid) for which there are almost no data on regional abundance or trends in abundance. Finally, for some resources, the spill or natural changes may be causing increased predation.

The long-term problems with pelagic-feeding resources may be related to the oil spill or may be due to natural causes. In some cases, it may be caused by decadal changes in nutrient or climatological cycles. In any case, understanding the causes of the decline of the pelagicfeeding resources is a prerequisite for taking action to accelerate recovery from the oil spill effects. It is a high priority area of research for all of the species that feed in pelagic areas. 3. Disruption of Nearshore Community Structure. The disruption of community structure and the recovery of this structure is the most important research issue for the community of plants and animals that inhabit shoreline areas.

Intertidal and subtidal organisms are not a single species; rather, the label refers to a complex and diverse group of benthic organisms - those small plants and animals that dwell in and on the intertidal and subtidal sediments. Before the spill, these communities had established an ecological equilibrium. Once disrupted, these communities may not return to prespill conditions by slowly regrowing benthic plants and animals in equal proportion to what existed before. Instead, the composition of the communities can change dramatically. For example, the removal of an important predator such as sea otters, which voraciously eat a select few intertidal and subtidal organisms, can allow the proportion of those prev organisms to increase. Historically, when sea otters were greatly reduced by hunting, sea urchins increased greatly and the kelp which they eat disappeared. As sea otters subsequently increased, they reduce the abundance of sea urchins, and kelp beds again expand. The kelp beds, in turn, can influence the composition of the rest of the benthic community. As another example, opportunistic algae have taken advantage of oil spill devastation to dominate the intertidal area once inhabited mostly by other organisms. The algae may be followed by sea urchins, snails, or other groups. Only through successive domination by different organisms is the original community re-established. The extent to which these effects are occurring in the oil spill area needs to be determined.

The disruption of the nearshore biological communities is due to the direct impacts of oiling and the cleanup on the intertidal organisms, and to the removal of keystone predators such as sea otters from the oiled areas. While the initial disruption of these benthic communities is attributed to oil, continued exposure or toxicity is not considered a high priority factor influencing their recovery. Rather, ecosystem processes that control community structure are now the primary factors influencing recovery. To understand why certain organisms are not recovering, research may need to include both the intertidal and subtidal communities to determine the mechanisms responsible for variation in the recruitment, growth, condition, and survival.

The most important research questions concerning community structure impacts that are identified for the nearshore ecosystem are:

- Are spill-caused changes in population of dominant competitors and resident predators (such as sea otters) limiting recovery of the community?
- Did the oil spill induce changes in the population of benthic prey species that are influencing the recovery of benthic foraging predators or subsistence use?
- Is recovery of the community structure limited by recruitment processes (the availability of new organisms to repopulate the area)?

Chapter 3

• Do physical processes limit recovery of the nearshore ecosystems?

4. Mussel Beds and Continued Exposure to Oil. Oil trapped in the sediments beneath the byssal thread mats of mussel beds in protected areas has degraded slowly and has retained toxic components since the spill. The sheltered beds are one of the few sources of unweathered oil remaining from the spill.

The original cleanup avoided the mussel beds because the proven techniques available at that time would have further injured or destroyed the mussels and decreased the available food supply for their predators. In addition, it was thought that winter storms and other natural processes would purge the mussels of residual oil. In 1991, after exploratory field surveys, the persistence of crude oil underlying some mussel beds in Prince William Sound began to cause concern among scientists and agency managers.

The byssal mats and the layer(s) of mussels themselves protect the oil in an anaerobic environment and retard natural weathering and cleaning. However, there is slow remobilization of the oil and mussels, and the underlying sediments likely provide a continuing source of oil contamination in Prince William Sound. The oiled mussels continue to be a probable route of oil exposure to higher level predators such as sea otters, harlequin ducks, and black oystercatchers. This continuing exposure may be significantly delaying recovery from the spill in some predators, for example in harlequin ducks. Research concerning the effects of continued exposure from mussel beds and other sources is a high priority area of research.

5. Escapement of Sockeye Salmon into the Kenai River System and on Kodiak Island. This is a high priority area of research and is important for many of the fishing communities of the spill area.

Several years of overescapement of sockeye salmon into the Kenai River and Kodiak Island lakes have produced ecosystem-level changes in the community structure of the lake-rearing habitat in which juvenile sockeye spend two or more years. Predation of the zooplankton by the overabundant juveniles resulting from the overescapement may have altered the zooplankton community in a number of ways. It may have altered composition of the zooplankton community to a predation-resistant form; it may have reduced the zooplankton biomass; or the juvenile salmon may be obtaining adequate food only through increased foraging time which results in increased predation. In any case, investigation of community structure changes in sockeye lake-rearing habitat is a high priority area of research.

Other: Ecologic Monitoring. Answering ecological questions will require long-term monitoring of ecosystem components. Any detailed understanding of ecosystems requires long-term data sets with which to evaluate normal variation in the distribution and abundance of key ecosystem components. It is not possible to evaluate status and trends of populations without historical perspective on changes in distribution and abundance of the species and

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their predators and prey, and in some cases, long-term meteorologic or oceanographic data that is not now available. Acquiring this data is a high priority because the information is fundamental to the high priority ecosystem questions described above. However, ecosystem monitoring and research that are not necessary for restoring resources and services injured by the spill, are not eligible for restoration funding.

Factors Constraining Recovery

The previous section discussed five priority areas of ecosystem research that would help explain why some resources are not recovering from the spill. In most cases the research affects multiple resources.

While there are many factors that may influence the long-term health and recovery of an injured resource, the April workshop focused on identification of key research questions that warrant attention in 1995. The relationship between the factors constraining recovery and individual resources is summarized in Table 3. The high-medium-low priority rating in the table describes the relative need for research to help explain what is currently constraining recovery of the resource.

The research areas are summarized by eight broad questions.

Is it Oil? Is it Human Impact? Is it Food, Competition, or Predation? Is it Climatic/Oceanographic Features? Is it Disease? Is it Habitat? Is it Community Structure? Other?

Each question is discussed in the pages following the table.

FACTORS THAT MAY BE CONSTRAINING RECOVERY		INJURED RESOURCES THAT ARE NOT RECOVERING A CARL STATE OF THE STATE ARE NOT RECOVERING A CARL STATE OF THE ST											
		Herring	Pink Salmon	Sockeye Salmon	Common Murre	Marbled Murrelat .	Pigeon Guillemot	Harlequia Duck	Sea Otter	Harbor Seal	Inter- : tidal	Sub- tîdal	Archise- ology
Direct Impacts of Qil	Is it Oil? Direct toxicity Heritable genetic damage	High High	Low High	-	-		Medium	High	High	Low	Low	Low	· ·
Human Impact	Is it Human Impact? Resource exploitation Effect of hatcheries Upland development	Low Low Low	Low High Low	Low	Low	Medium Low Medium	Low Low		Low	High Low		۴ ۲	High
Ecosystem Processes	Is it Food, Competition or Predation?	· · · · · · · · · · · · · · · · · · ·			L.		-	- 1	1		~	1	-
```* ``*	If food limiting? Has predation increased? Is it competition?	High High	Med. High High	High High High	High High	High High	High Medium	Low	High Low	High High	Low High High	Low High High	
	Is it Climatic/ Oceanographic Features?	High.	High	, J	High	High	High	Low	Low	Med.	High	High ×	
	Is it Disease?	High	,	ļ	Low				Med.	Med.			
· ·	Is it Habitat?	Med.	Low	Low	-	Medium					r		, 
	Is it Community Structure?	1	~	High	×.	-	-	-	High		High	Hìgh	4.
· · · · · · · · · · · · · · · · · · ·	Other? Recruitment processes Behavior change	Med.	Low	· · ·	Low		r.	High	Low	Low	High	High	-

Table 3. Summary of Priority Research Issues Concerning Why Resources Currently are Not Recovering

Chapter 3

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Five years after the spill, exposure to oil may still be constraining recovery because of direct toxicity — the initial or continued exposure to oil — or because of heritable genetic injury. The first of these problems, direct toxicity, is a high priority area of research for herring, harlequin ducks, and sea otters, but it may also be affecting other resources that feed or spawn in the intertidal areas including pink salmon, pigeon guillemots, harbor seals, and intertidal or subtidal resources.

The second problem, heritable genetic damage, is a high priority area of research to explain continuing problems with pink salmon and herring in Prince William Sound.

**Direct Toxicity.** At the time of the spill, exposure to oil killed many animals and caused sublethal effects to others. For some resources, this initial exposure may still be preventing recovery. Pacific herring may provide an example of this effect. The 1992 and 1993 herring runs in Prince William Sound were substantially below the predicted level, and the returning herring had a virus (viral hemorrhagic septicemia — VHS). The failed runs and the viral disease may be related to the original exposure to oil.

In addition to the original exposure, some resources may still be exposed to toxic oil. Oil trapped in the sediments beneath certain mussel beds that are protected from winter storms has degraded slowly and has retained toxic components since the spill. The protected beds are one of the few sources of unweathered oil remaining from the oil spill. This oil may be a route of continued exposure and contamination to higher trophic levels such as harlequin ducks that feed on the mussels. The continued exposure to unweathered and toxic oil may be causing reproductive failure — a near-complete lack of breeding by some harlequin ducks in oiled areas. (See Priority Ecosystem Issues #4, page 26.)

The two examples illustrate the concerns that remain for some resources with significant continuing or previous exposure to oil. While the examples use harlequin ducks and herring, there is also some concern that remaining oil may be constraining recovery of sea otters, and intertidal and subtidal organisms.

Heritable Genetic Damage. There is evidence that exposure to oil caused genetic damage in pink salmon and possibly herring. Genetic damage may occur not only to the year class that spawned or were exposed during the intense 1989 oiling, but can also be passed down — inherited — to the offspring. The genetic damage may be causing reduced size or reproductive success. While the initial damage is not unexpected, the fact that it may be passed down through generations is an unexpected research finding. This is a very critical area of research for pink salmon and Pacific herring.

### Is it Human Impacts?

Though the spill caused population declines and sublethal injuries to resources, in some cases the effects of development may be constraining recovery. These effects are particularly important in the sense that they are controllable — once understood, it may be possible to change our actions to help restoration along.

**Resource Exploitation.** Resource exploitation including incidental fishing mortality (e.g., incidental catch of marbled murrelets in gillnets), increased boat traffic, or harvest activities may or may not be affecting the rate of recovery of some injured resources. In some cases, it is possible that these effects, which may have been minor at pre-spill population levels, are more important today because populations have been reduced by the spill or by an area-wide decline.

Resource exploitation is a high priority issue for harbor seals and archaeological resources. Harbor seal numbers are greatly reduced because of the ongoing decline, which was exacerbated by additional spill-related mortality. At this reduced level, the population may be impacted by any additional mortality, such as that caused by subsistence harvest or incidental take associated with fisheries. Vandalism of archaeological sites and artifacts, a kind of illegal resource exploitation, is also a high priority issue.

Resource exploitation is a low priority factor in the lack of recovery for the three commercial resources that are heavily harvested: herring, pink salmon, and sockeye salmon. This assumes that harvest management strategies will be designed to ensure appropriate escapement to the spawning populations. The strategies may require additional information efforts to ensure escapement of injured populations while allowing harvest of non-injured populations.

*Effects of Hatcheries.* Hatcheries have released billions of salmon into the Prince William Sound and the Gulf of Alaska ecosystem over the last decade. At various stages of their lives, these salmon consume significant quantities of either zooplankton or small fishes. They may compete directly with wild salmon, other fishes, seabirds, or marine mammals for this prey. Releases of hatchery fish may attract predators, which then also prey on other species. The effects of hatcheries are of concern for a variety of resources, and are a high priority for wild pink salmon research.

Upland Development of Habitat. Upland development such as urbanization or logging can eliminate some nesting habitat for marbled murrelets or affect habitat in anadromous streams. Research into the relationship between upland development and factors constraining recovery is not considered a high priority issue for research this year. However, since the amount of available habitat may constrain the size of recovered populations, protecting habitat is an important method of protecting natural recovery.

### Is it Food, Competition, or Predation?

There is evidence that some of the food webs that interconnect injured resources have changed in response to natural events or the spill. In fact, some of the oil spill impacts are expressed in disrupted food webs: limited prey, or increased predation and competition. The natural and oil-induced changes have profound implications on the populations of injured resources, and understanding the changes is important to achieving restoration. The understanding is also important in setting harvest limits on those resources that we hunt and fish. (See Priority Ecosystem Issues #1, page 24.)

Is Food Limiting? Has competition increased for limited resources? Since the mid-1970s, a variety of species of marine mammals and seabirds that feed in pelagic (offshore) areas have been declining in the northern Gulf of Alaska and Prince William Sound. (See Priority Ecosystem Issues #2, page 24.) All of the declining species rely at least in part on forage fishes such as herring, capelin, sandlance, smelt, and juvenile pollock for food. During the approximately 20 years that marine mammals and sea birds have been declining, the estimates of pollock biomass have increased substantially. The biomass of other forage species may have decreased, but there are almost no data on these species. The northern Gulf of Alaska has experienced a warming trend during the same time, which may have affected the abundance of these forage species.

If food or increased competition is limiting recovery, it may be related to the oil spill or it may be due to natural causes. In any case, understanding the causes of the decline of the pelagic-feeding resources is important for taking action to accelerate recovery, and it is a high priority area of research for all of the resources that feed in pelagic areas.

*Has Predation Increased?* Increased predation is a high priority area of research for pink and sockeye salmon, herring, harbor seals, murres, marbled murrelets, and intertidal and subtidal resources.

Recent declines in some fish (pink salmon and herring) and marine mammals (harbor seals and sea lions) may have significantly changed the availability of prey to top predators and caused them to prey more on other species. For example, when pink salmon are less numerous, eagles may prey more heavily on nesting seabirds. Reduced availability of salmon and herring may cause killer whales to prey more heavily on marine mammals. Furthermore, since the numbers of seals and sea lions are greatly reduced, predation may have a far greater impact on the population.

In addition, there is concern that in some colonies of common murres, so many adults were killed by the spill that juveniles did not learn some defenses against predators. The result may be that during breeding, fewer murre chicks are surviving.

### Is it Climatic/Oceanographic Features?

Climatic and oceanographic influences on recovery of injured resources were identified as a high priority research issue for injured resources in both the pelagic and the nearshore ecosystem. These physical factors may have direct effects on injured resources, such as the impact of advective transport of herring larvae on recruitment, thereby affecting the herring population; or the relationship may be indirect, such as the relationship of temperature to zooplankton abundance which may drive the abundance or availability of forage species for marine mammals and seabirds and thereby influencing the population of those resources. These types of relationships were considered a high priority research area for herring, pink salmon, common murres, marbled murrelets, pigeon guillemots, and intertidal and subtidal organisms.

As increasingly sophisticated computers make complicated analyses of historical data possible, it is becoming evident that some changes in populations of fishes, birds and marine mammals may be related to long-term cycles (decades or more). Integrated research on ecosystem processes and how they influence injured resources must include the development of long-term data series of key ecosystem components in order to have the historical context to evaluate status and trends of injured populations. An important objective of research on ecosystem processes should be the identification of these key components for long-term, costeffective monitoring. This information will be essential for evaluating ecosystem variability and separating climatic effects on population status from oil or other factors influencing recovery of injured resources.

### Is it Disease?

In both 1993 and 1994, spawning herring in Prince William Sound were infected with viral hemorrhagic septicemia — VHS. This disease may be associated with stress. Herring may be stressed by ongoing effects of the spill, and this stress may have resulted in appearance of this viral disease. Disease is a high priority research issue for herring.

Disease has also been identified as a research issue for harbor seals, although it is not considered a high priority issue at this time. Within the last decade, an outbreak of phocine distemper caused widespread mortality of harbor seals in the North Atlantic. It has been suggested that a similar disease outbreak could be responsible for the ongoing decline of harbor seals in Prince William Sound and the Gulf of Alaska. Preliminary viral and bacterial screening suggest no signs of a disease problem, but this question has not yet been thoroughly resolved.

There is also some concern that natural or spill-related diseases are affecting common murres and sea otters; although as with harbor seals, disease is not considered to be a high priority issue at this time.

### Is it Habitat?

Productivity of rearing habitat may limit the ability of an injured resource to recover from damage from the oil. This could be because of natural limitations, oil-induced changes such as the persistent effects of oil, or human disturbance. While habitat protection is considered essential for the long-term health of all resources in the spill area, research issues concerning habitat are not considered a high priority for this year, though the lack of reproductive habitat has been identified as a concern for herring, pink salmon, sockeye salmon, and marbled murrelets.

### Is it Community Structure?

The disruption of community structure and the recovery of this structure is the most important research issue for the community of plants and animals that inhabit shoreline areas. It is a high priority for inter- and subtidal resources, sea otters, and sockeye salmon. (For intertidal resources, subtidal resources, and sea otters, see Priority Ecosystem Issue #3, page 25. For sockeye salmon, see Priority Ecosystem Issue #5, page 26.)

### Other?

**Behavior Change.** After the spill, some colonies of common murres, which usually breed all at once, began stretching out their breeding season and breeding late in the season. This decreased the effectiveness of one of the murre's defenses against predation: breeding in dense groups. In addition, the late-breeders were producing young so late that they were not surviving the winter storms. There is recent evidence that murre breeding patterns are becoming more normal, and this is not a high priority area of research.

**Recruitment Processes.** Few harlequin ducks are successfully breeding in oiled areas of western Prince William Sound. Juvenile harlequins are not being recruited into the western Prince William Sound population of harlequins. One possible explanation for the failure is continued exposure to toxic, unweathered oil through the mussel beds in which the harlequins feed. (See further explanation under "Is it Oil? Direct Toxicity".) Whatever the explanation, understanding the harlequin duck breeding problem is an area of high priority research.

Recruitment processes are also high priority for intertidal and subtidal organisms. For example, the ability of the seaweed *fucus* to recolonize upper intertidal areas where it was eliminated during the spill cleanup may be a determinant of the intertidal community structure. (See Priority Ecosystem Issues #3, page 25.)

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### Chapter 4

## GENERAL RESTORATION STRATEGIES

This chapter explains definitions and criteria important for general restoration projects. It also provides examples of important general restoration projects. Priority projects, however, have not yet been identified. Trustee Council staff is currently working with scientists to review general restoration ideas and projects that were submitted during previous years, and it hoped that other recommendations will be received through this *Invitation to Submit Restoration Projects*.

## Criteria from the *Draft Restoration Plan*

This section of the chapter contains definitions and criteria from the *Draft Restoration Plan* that are important for General Restoration projects. Until the Final Restoration Plan is adopted, the Trustee Council will use the information in the *Draft Restoration Plan* to help select projects for the Draft 1995 Work Plan.

A General Restoration Project to Restore An Injured Resource Should... General Restoration projects intended to help an injured resource recover can generally be divided into one of three categories. These include projects that will:

- increase the rate of recovery
- increase the degree of recovery (enhancement)
- increase protection for injured resources

Increase the Rate of Recovery. Some projects help a resource recover faster — that is, they help accelerate the rate of recovery. The rate of recovery is the number of years that a resource or service will require until it returns to the state it would have been in the absence of the oil spill. It is the length of time for a population to recover or, in the case of a declining species, to reach a population level that would have occurred in the absence of the oil spill. The length of time varies, depending on the species, from a few years to more than a hundred.

A project that increases the rate of recovery may not change the long-term population level of the species; it may only allow the resource to achieve that level more quickly. For example, if it was possible to eliminate the residual oil in some mussel beds that may still be affecting harlequin ducks, it could speed up their recovery without changing their eventual, long-term recovered population.

Increase the Degree of Recovery (Enhancement). Other projects, such as creating new salmon spawning or rearing areas, have the potential to affect (enhance) long-term population levels. They change the actual number of fish or animals in the long-term population. These options change the degree of recovery.

Increase Protection for Injured Resources. Some projects protect natural recovery and allow it to proceed with a minimum of interference. In this way, they may affect the rate or degree of natural recovery. Projects may provide information to allow agencies to manage human use to protect the habitat or to protect the injured resources directly. Examples include redirecting hunting and fishing harvest, or reducing disturbance around sensitive breeding areas. Other protection projects might reduce marine pollution that is stressing a resource or delaying recovery.

A General Restoration Project to Restore An Injured Service Should...

The restoration fund may be used to restore the reduced or lost services provided by injured resources. In the *Draft Restoration Plan*, the Trustee Council adopted a policy providing that a project to help restore an injured service should

- have a sufficient relationship to an injured resource, and
- benefit the same user group that was injured.

The relationship between the proposed activity and the injured resource which caused the reduced or lost service is the subject of the first part of this principle. It requires that a project to restore or enhance an injured service must be sufficiently related to a natural resource. It can be related to a natural resource in various ways. It could directly restore a resource, provide an alternative resource, or restore access or people's use of the resource. The strength of the required relationship has not been defined by law, regulation, or the courts. However, a connection with an injured resource is necessary. In determining whether to fund a project to restore services, the strength of the project's relationship to injured resources will be considered.

A few examples may help understanding. One way to aid commercial fishing is to restore injured salmon runs or to provide alternative runs. However, the restoration fund cannot be used to give cash grants to fishermen to cover spill-related losses. This latter idea is unrelated to an injured resource. As a second example, subsistence was injured, in part, because the resources it relies on were injured. Habitat may be purchased to provide alternative areas for subsistence where uninjured resources exist. The restoration fund may also be used to enhance or establish alternate subsistence resources, or provide information about the safety and availability of subsistence resources, or even to provide facilities such as a shelter cabin that provides for easier access to alternate resources. In these cases, the restoration activity has a relationship to injured resources: it provides replacement resources, allows users to make better judgement about use of the resources, or provides easier access to alternative resources. However, the restoration fund could not be used to help subsistence users in general, such as providing a warehouse or generator in a subsistence community, because there is no relationship to an injured resource.

The second part of the principle ensures that the injured user groups are the beneficiaries of restoration. If the justification for an action is to restore a service, it is important that the user group that was injured be the one that is helped.

### Examples of General Restoration Strategies

This section provides examples of general restoration projects that were funded in 1994.

Cleaning Mussel Beds — A project to increase the rate of recovery. The original cleanup following the spill avoided mussel beds because the proven techniques available at that time would have further injured or destroyed the mussels, and decreased the food supply available for the birds and other resources that feed on them. In addition, it was thought that winter storms and other natural processes would purge the mussels of residual oil. In 1991, after exploratory field surveys, the persistence of crude oil underlying some mussel beds in Prince William Sound began to cause concern among scientists and agency managers.

The byssal mats and the layer(s) of mussels themselves protect the oil in an anaerobic environment and retard natural weathering and cleaning. However, there is slow remobilization of the oil and mussels, and the underlying sediments likely provide a continuing source of oil contamination in Prince William Sound. The oiled mussels continue to be a probable route of oil exposure to higher level predators such as sea otters, harlequin ducks, and black oystercatchers. This continuing exposure may significantly delay recovery from the spill in some predators, for example in harlequin ducks.

In 1994, the Trustee Council allocated \$518,000 (Project 94090) to clean oiled mussel beds in western Prince William Sound. Scientists hope that cleaning the mussel beds will remove an important source of continued oil exposure and thereby start or accelerate recovery of the resources that feed on the mussel beds such as harlequin ducks, black oystercatchers, and sea otters.

Lake Fertilization in Coghill Lake. The production of sockeye salmon from Coghill Lake, in western Prince William Sound, declined for reasons unrelated to the oil spill. In 1994, the Trustee Council allocated \$324,100 (Project 94259) as part of a continuing program to fertilize the lake to increase production back to its historic levels. Until the recent decline, Coghill Lake was an important salmon run for commercial and sport fishermen in Prince William Sound, and restoring the run will provide natural stocks to replace those hurt by the spill. The primary benefit to restoration will be to improve the commercial, sport, and subsistence fishing opportunities by enhancing the population.

**Removal of Introduced Predators.** In 1994, the Trustee Council allocated \$84,000 (Project 94041) to eliminate introduced foxes on three islands just outside the spill area. The foxes are not natural to the islands and remain from abandoned fur-farming operations that began before 1930. Removing foxes that prey on breeding common murres, pigeon guillemots, and black oystercatchers and other seabird resources would likely increase immediate and long-term populations of these resources in the spill area.

Instream Fish Habitat Improvements. The Trustee Council allocated \$755,000 (Projects 94139 and 94043) to improve instream habitat for four salmon species, cutthroat trout, and Dolly Varden. The funding will be used to improve instream habitat by constructing

bypasses that allow salmon to get past waterfalls to new spawning habitat, by constructing spawning channels, or other techniques to improve habitat and increase the populations of these resources. Since the quality and availability of instream habitat is not known to be a limiting factor for the recovery of these resources, the primary benefit to restoration will be to improve the commercial, sport, and subsistence fishing opportunities by enhancing the populations.

Stock Separation Projects. In 1994 and previous years, the Trustee Council approved a variety of projects to provide stock separation information. The information is important to allow the Alaska Department of Fish and Game, which sets harvest regulations, to vary the timing and location of fishing to minimize harvest of the injured fish runs, particularly salmon. This task typically involves stock separation so that fisheries managers can determine the portion of the catch (at different locations and times) that originates from the different runs. Marking programs and genetic stock identification are examples of management tools for stock separation. This information is beyond that historically gathered by the department and would allow it to manage fishing to protect the injured runs. The projects protect recovery of the injured stocks and of commercial and sport fishing by avoiding harvest limits that would further injure commercial and sport fishing services.

Waste Oil Disposal Facilities. In spite of regulations and enforcement actions, a substantial (but unknown) amount of waste oil finds its way into the marine environment. In 1994, the Council approved \$232,200 (Project 94417) to fund a pilot program to create waste oil recycling or disposal programs in six small communities in the spill area. The waste oil recycling or disposal facilities will decrease chronic marine pollution from these communities. In this way, the project will minimize the amount of additional oil that is reaching resources injured by the spill. It will protect recovery by minimizing interference from chronic marine pollution from these communities.

Other Projects — We Need Your Help! Trustee Council staff is currently working with scientists to review previously submitted general restoration ideas for consideration as possible projects for 1995. In addition, we are hoping that the public will submit effective General Restoration projects in response to this Invitation to Submit Restoration Projects.

# Appendix A

# DRAFT RESTORATION OBJECTIVES AND STRATEGIES BY RESOURCE AND SERVICE

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Appendix A: Draft Objectives and Strategies

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# Introduction

For each resource or service injured by the oil spill, the *Draft Restoration Plan* identifies strategies to accomplish recovery. The appendix begins by summarizing those strategies. The *Draft Restoration Plan* will be distributed for public review June 18 through August 1, 1994. Thus, the Final Restoration Plan may change some of the strategies summarized in this appendix.

In the remainder of the appendix, resources and services injured by the oil spill are listed alphabetically. For each resource and service, the appendix first lists the recovery status — a brief description of the current condition of the resource or service. That is followed by the objective — the definition of recovery for that resource or service. It is a measurable definition of what condition the restoration program should accomplish. Any restoration project should help the restoration program reach those objectives (i.e., to accomplish recovery for one or more injured resources or services).

Finally, the appendix lists monitoring, research, and general restoration strategies identified by the workshop. The strategies in this appendix are preliminary and have not been subject to further scientific, legal, or policy review. However, they provide the best current indication of 1995 restoration needs. Also, there is considerable duplication in this appendix, because many resources have similar monitoring, research, or general restoration strategies.

Appendix A: Draft Objectives and Strategies

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# Strategies for Achieving Restoration

The Draft Restoration Plan (November 30, 1993) outlines strategies to accomplish recovery. This section of the appendix summarizes those strategies. For more information, see the Draft Restoration Plan, especially Chapter 4.

### Restoration Strategies from the *Draft Restoration Plan* Part A. Biological Resources

Biological Resources	Primary Restoration Strategy (from Draft Restoration Plan)			
<b>Recovering Resources</b> Bald eagle Black oystercatcher Killer whale Sockeye salmon at Red Lk*	<ul> <li>Primary Restoration Strategy</li> <li>Rely on natural recovery</li> <li>Monitor recovery</li> <li>Protect injured resources and their habitats</li> </ul>			
Resources Not Recovering Common murre Harbor seal Harlequin duck Intertidal organisms Marbled murrelet Pacific herring* Pigeon guillemot Pink salmon* Sea otter Sockeye Salmon (Kenai & Akalura Systems)* Subtidal Organisms	<ul> <li>Primary Restoration Strategy</li> <li>Conduct research to find out why these resources are not recovering</li> <li>Initiate, sustain, or accelerate recovery</li> <li>Monitor recovery</li> <li>Protect injured resources and their habitats</li> </ul>			
Recovery Unknown Clams* Cutthroat trout Dolly Varden trout River otter Rockfish	<ul> <li>Primary Restoration Strategy</li> <li>Rely on natural recovery</li> <li>Monitor recovery</li> <li>Protect injured resources and their habitats</li> </ul>			
resources, waiting for natural recovery may significantly harm a community or industry, and the strategies for subsistence or commercial fishing also apply (see Part C of the table).				

Part	<b>B</b> .	Other	Resources	

Other Resources	Primary Restoration Strategy (from Draft Restoration Plan)
Archaeology	<ul> <li>Primary Restoration Strategy</li> <li>Repair spill-related injury to archaeological sites and artifacts</li> <li>Protect sites and artifacts from further injury and store them in appropriate facilities</li> <li>Protect injured resources and their habitats</li> </ul>
Designated Wilderness Areas	Primary Restoration Strategy Any restoration strategy which aides recovery of injured resources, or prevents further injuries will assist recovery of designated wilderness areas. No strategies have been identified which benefit only designated wilderness areas without also addressing injured resources.

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Services	Primary Restoration Strategy (from Draft Restoration Plan)
Commercial Fishing	<ul> <li>Primary Restoration Strategy</li> <li>Promote recovery of commercial fishing as soon as possible</li> <li>Protect commercial fish resources as soon as possible</li> <li>Monitor recovery</li> </ul>
Recreation and Tourism	<ul> <li>Primary Restoration Strategy</li> <li>Preserve or improve the recreational and tourism values of the spill area</li> <li>Remove or reduce residual oil if it is cost effective and less harmful than leaving it in place</li> <li>Monitor recovery</li> </ul>
Passive Uses	Primary Restoration Strategy Any restoration strategy which aids recovery of injured resources, or prevents further injuries, will assist recovery of passive-use values. No strategy has been identified that benefits only passive uses, without also addressing injured resources.
Subsistence	<ul> <li>Primary Restoration Strategy</li> <li>Promote recovery of subsistence as soon as possible</li> <li>Remove or reduce residual oil if it is cost effective and less harmful than leaving it in place</li> <li>Protect subsistence resources from further degradation</li> <li>Monitor recovery</li> </ul>

Part C. Services

# Objectives and Strategies by Resource and Service

### Archaeological Resources

Recovery Status: Injury to archaeological resources stems from increased looting and vandalism of sites and artifacts, and erosion within and around the sites resulting from cleanup activities. In addition, archaeological artifacts may have been oiled. Injuries attributed to looting and vandalism still occur. These injuries diminish the availability or quality of scientific data and opportunities to learn about the cultural heritage of people in the spill area.

Recovery Objective: Archaeological resources will be considered recovered when spillrelated injury ends, and looting and vandalism are at or below pre-spill levels. Restoration cannot regenerate what has been destroyed, but it can prevent further degradation of sites as well as the scientific information that would otherwise be lost.

**RECOVERY MONITORING STRATEGY:** <u>Background</u>: The current evidence suggests that a majority of the archaeological site vandalism that can be either directly or indirectly linked to the *Exxon Valdez* oil spill event occurred in 1989 before adequate constraints were put into place over the activities of oil spill cleanup personnel. Most of this vandalism took the form of prospecting for sites with high artifact yields. Numerous small holes, from 0.5 to 2.0 meters in size, were dug by vandals in 17 known sites (projections based on existing data suggest that about 100 additional sites were similarly vandalized).

Evidence of vandalism dropped dramatically after 1989, probably reflecting the more effective archaeological constraint system that had been put into place by the participating agencies, with the cooperation of Exxon Corp., by the late summer of 1989. This apparent drop in vandalism was unexpected and at first suggested that continued vandalism related to the *Exxon Valdez* spill event might not be a significant future concern. However, based on what we know about the behavior patterns of archaeological looters, the activity focus of vandals may have shifted (or will shift) from general prospecting to a more focused pattern of looting at a select number of high-yield archaeological sites that were identified by looters during the initial "prospecting" phase, or simply observed by more discrete potential looters engaged in cleanup operations in the post-1989 era. Artifact hunters are most likely to act on the opportunities presented by this knowledge in the next 15 years while their memories remain fresh; thereafter, the threat should gradually drop as the information loses "immediacy" and specificity.

A second oil-spill factor may greatly increase the likelihood that looter knowledge gained in the oil-cleanup period might be activated at any time at high-yield sites. The injury to commercial and subsistence species (e.g., harbor seals and herring) may create conditions of economic depression in several Gulf of Alaska communities that will increase the temptation to turn to commercial archaeological looting as an alternative source of income to make up

for the income loss in other sectors. (Note: Loss of subsistence species forces users to use limited cash to purchase food and other products.) Studies of the economics of archaeological looting in Utah and elsewhere, such as St. Lawrence Island, have shown that commercial digging increases in communities that are experiencing economic downturns.

Another compelling reason to be concerned is that demand for Alaskan archaeological materials is at an all-time high by art dealers, jewelers, and knife makers. The prices of single slate ulus now approach \$500 at certain galleries; rare pieces of ivory and bone may be sold for over \$100,000.

Strategy: Archaeological monitoring of archaeological sites injured by the spill or spillrelated activities will target a small number of sites which are determined to represent those that are most vulnerable to serious, commercial looting. There will be two categories of sites scheduled for continued monitoring. The first group, or index group, will consist of 4 known sites that will be monitored on a yearly basis for signs of vandalism. The selection of these sites will be based on their potential vulnerability to pot hunting and will be independent of jurisdiction. That is, no attempt will be made to distribute index sites equally by political jurisdiction or agency jurisdiction. One or two of these sites will also be selected for continued hydrocarbon monitoring so the behavior and effect of oiling can be observed over the long term in archaeological deposits. A second group of 4 sites will be selected for monitoring, but on a biannual basis. This second group of sites may vary over time in order to maintain flexible response to new information such as fresh reports of vandalism or new findings on patterns of looting. The second group of sites provides a cross-check to monitoring data collected at the index sites. By focusing annual monitoring on 4 index sites and using a 2-year monitoring schedule on the additional 4 "cross-check" sites, expenditures would be kept to a minimum, but at a level that would still provide adequate tracking of vandalism trends over the years.

Because baseline data have already been collected on the sites that would be monitored, local people and communities will be included in the monitoring effort whenever possible. Agency archeologists will serve as managers of the monitoring effort and conduct any specialized or difficult monitoring actions. This local involvement will also serve as a social mechanism for discouraging certain individuals from engaging in looting by encouraging the growth of cultural pride and heritage knowledge in the communities. Guidance for obtaining local participation will be sought in the results of the initial phase of the already funded "Community Archaeological Site Protection Plans Project." The first phase of this project, which will outline an effective approach for the involvement of local communities in archaeological protection, will be completed by the Office of History and Archaeology, State of Alaska, by September/October 1994. In order to avoid duplication of effort, every effort will be made to coordinate and integrate the archaeological monitoring program with the community archaeological protection activities.

Monitoring Schedule: Monitoring of index sites will occur on a yearly basis. This schedule is necessary to interdict vandalism before the damage has become severe and to insure that all signs of vandalism would be visible (e.g., unvegetated ground). The second group of sites will be monitored on a biannual basis which should be sufficient to identify at least the majority of vandalism indicators before they are hidden by vegetation. If monitoring indicates a strong recovery trend by the year 2000, the monitoring interval for index sites can shift to every two years and the interval for cross-check sites to every four years.

Estimated Recovery Time: Recovery will have been achieved when all vandalism that was stimulated by the *Exxon Valdez* oil spill has ceased and any required data recovery actions (e.g., professional excavation of looted site areas) or other mitigative actions (e.g., stabilization of vandalized site areas) designed to address documented injury have been completed. The best professional judgement estimates the achievement of recovery by the year 2020. This period of time should see the present generation of archaeological looters disappear, hopefully discouraged by local community education programs, site protection programs, and the social pressures created by a citizenry having a sense of "ownership" and pride in their archaeological heritage. In addition, a thirty-year span should result in the dissipation of any remaining oil contamination in archaeological deposits.

**RESEARCH STRATEGIES:** Archaeological sites are a promising source of long-term ecological data. The archaeological record, though often coarse-grained in terms of precise dates, may offer answers to some of the questions posed by contemporary ecosystem scientists who are trying to discriminate between changes that have links to the oil spill and those that represent fluctuations in natural systems over time.

Another source of long-term data may be found through ethnographic and historical research. Native Alaskans over the past millennia have accumulated a rich storehouse of information about the local environment, and though much of this knowledge has been lost of late, much still survives. The survival of coastal Native peoples has always depended on accurate, empirical observations about the world and its fickle environment. Historical archives and the memories of non-Native Alaskans also may offer valued information on the operation of the environment in the past.

Two hypotheses have been identified for using archaeological resources to study cultural dynamics and ecological history. The hypothesis for cultural dynamics is that ecosystem shifts have caused major cultural shifts in the spill area. The hypothesis for ecological history is that archaeological, ethnographic and historic data can produce an informed comparative baseline for EVOS ecosystem studies. Existing archaeological collections may contain faunal/floral samples which will provide critical insights into specific ecosystem problems. Once assessed, the existing data should be supplemented by specific site excavation designed to fill in data gaps.

GENERAL RESTORATION STRATEGIES: In the FY 94 work plan, the Trustee Council approved Project 94007. Through this project, "Community Archeological Site Protection Plans" are being prepared by the Office of History and Archaeology, State of Alaska. These plans will address such topics as stabilizing eroding sites, removing and restoring artifacts, the reduction of looting and vandalism, the removal of artifacts from sites and storage in an appropriate facility, and affording the opportunity to view or learn about the cultural heritage of people in the spill area. Implementation of these protection plans should be a top priority for general restoration projects for archaeological resources. Although the plans will not be in final, peer-reviewed form until May 1995, a draft of the plans will be ready by October 1994 and should serve as the basis of preparatory projects.

### **Bald Eagles**

**Recovery Status:** Two hundred to 300 bald eagles may have been killed in the spill. However, population estimates made in 1989, 1990, and 1991 indicate that there may have been an increase in the PWS bald eagle population since the previous survey conducted in 1984. Productivity decreased in 1989, but appeared to have recovered by 1990.

**Recovery Objective:** Because population and productivity appear to have returned to prespill levels, bald eagles may have already recovered from the effects of the spill.

**RECOVERY MONITORING STRATEGY:** Aerial surveys of Prince William Sound using fixed wing aircraft were used before and after the spill to estimate bald eagle population size. Based on modelling, the Prince William Sound eagle population was expected to increase to its prespill level by 1994. Aerial surveys will be conducted in 1995 to verify this prediction. Productivity of Prince William sound bald eagles will be measured using helicopter surveys in 1995 to verify that it is normal given the dramatic declines of its major prey species, pink salmon. If population and productivity of Prince William Sound bald eagles is normal in 1995, monitoring will be conducted at five year intervals. If the 1995 surveys indicate declines in population or productivity, more frequent surveys will be conducted. There is not enough pre-spill data on eagle populations in other parts of the spill area to warrant surveys outside Prince William Sound.

Monitoring Schedule: A PWS population and productivity survey should be conducted every 5 years starting in 1995.

Estimated Recovery Time: 5 years

**RESEARCH AND GENERAL RESTORATION STRATEGIES:** Bald eagles are recovering and may have recovered from the spill. No research or general restoration strategies are expected for the 1995 work plan.

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### **Black** Oystercatcher

Recovery Status: Black Oystercatchers are recovering, although oystercatchers may still be exposed to hydrocarbons when feeding in intertidal areas.

**Recovery Objective:** Black oystercatchers will have recovered when Prince William Sound populations attain prespill levels and when reproductive success of nests and growth rates of chicks raised in oiled areas are comparable to those in unoiled areas.

**RECOVERY MONITORING STRATEGY:** Population abundance and distribution in Prince William Sound will be monitored during boat surveys for marine birds and mammals. Growth rates of chicks will be monitored every two years.

Monitoring Schedule: Boat surveys of Prince William Sound bird populations should be conducted in the summer every three years starting in 1996. Chick growth rates will be monitored every two years for a six-year period starting in 1995.

#### Estimated Recovery Time: Unknown

**RESEARCH AND GENERAL RESTORATION STRATEGIES:** No research or general restoration strategies have yet been identified for the 1995 work plan.

#### Clams

**Recovery Status:** Littleneck clams and butter clams on sheltered beaches were killed by oiling and clean-up activities. In addition, growth appeared to be reduced by oil, but determination of sublethal or chronic effects is awaiting final analyses.

**Recovery Objective:** Clams will have recovered when populations and productivity have returned to levels that would have prevailed in the absence of the oil spill (prespill data or non-oiled control sites).

**RECOVERY MONITORING STRATEGY:** Paired oiled and non-oiled (control) clam beds will be sampled. Measures should be density and size-frequency distribution. Random sampling design within sites. Number and location of study sites to be determined from agency data and local subsistence usage. Consider sites throughout spill impact area.

Monitoring Schedule: Conduct one comprehensive study and then evaluate need for further monitoring.

Estimated Recovery Time: Unknown

**RESEARCH AND GENERAL RESTORATION STRATEGIES:** No research or general restoration strategies have yet been identified for the 1995 work plan.

### **Commercial Fishing**

**Recovery Status:** Commercial fishing was injured through injury to commercial fish species and also through fishing closures. Continuing injuries to commercial fishing may cause hardships for fishermen and related businesses. Each year that commercial fishing remains below prespill levels compounds the injury to the fishermen and, in many instances, the communities in which they live and work.

The Trustee Council recognizes the impact to communities and people of the Prince William Sound region resulting from the sharp decline in pink salmon and herring fisheries in past years. In the 1994 work program, the Trustee Council has committed to the expenditure of five million dollars to help address these issues through the development of an ecosystem based study for PWS. Some of the pink salmon and herring problems may be unrelated to the spill. However, the Council will continue to address these important problems as they relate to the oil spill.

**Recovery** Objective: Commercial fishing will have recovered when the population levels and distribution of injured or replacement fish used by the commercial fishing industry match conditions that would have existed had the spill not occurred. Because of the difficulty of separating spill related effects from other changes in fish runs, the Trustee Council may use pre-spill conditions as a substitute measure for conditions that would have existed had the spill not occurred.

**RECOVERY MONITORING STRATEGY:** The strategy we have taken thus far is to assess the fishery resources used by the commercial fishing industry to determine whether they were damaged and, if so, whether they are recovering. For example, we are trying to assess the health of the Prince William Sound pink salmon and Pacific herring populations as well as the status of Kenai River sockeye salmon by improving abundance estimation techniques. This is not an easy task since we have to deal with stock identification problems (wild and hatchery stocks in the case of Prince William Sound pink salmon) in order to sort out abundance/survival trends in stocks which seem to have been damaged by the oil spill. In some cases this has entailed marking studies (e.g. Prince William Sound pink salmon and Kenai River sockeye salmon smolts), genetic studies (e.g. Kenai adult sockeye salmon), hydroacoustic surveys (e.g. Kenai sockeye salmon adults and juveniles), and SCUBA surveys (e.g. Prince William Sound herring). Other stocks were studied for a short time (e.g. clams, shrimp, rockfish). So, it may be wise to collect some additional information in the future. In any case, an ecosystem approach, such as is proposed in the SEA study, might lead to a better understanding of injuries as well as better estimates of recovery time.

Monitoring Schedule: At this time, it is difficult to recommend doing monitoring on anything other than an annual basis for pink salmon, herring or sockeye salmon. For example, pink salmon populations on odd and even years are essentially genetically isolated while herring and sockeye salmon are composed of multi-aged cohorts of siblings. So, it would appear that critical information could be lost if monitoring was done, for example, only on alternate years. For clams, shrimp, rockfish, etc., it might be advisable to monitor these on some longer interval (e.g. every two or three years).

Estimated Recovery Time: It is difficult to estimate this for the fishery resources being studied at this time. For example, the next two years are critical for judging recovery of Kenai River sockeye salmon. If good runs occur this year and next year, the population has probably recovered. This year is critical for Prince William sound herring, which apparently were not very abundant (and were diseased) last year. Some Prince William Sound pink salmon populations may have been reproductively damaged, and it is difficult to determine when they might recover (either with or without restoration efforts).

**RESEARCH AND GENERAL RESTORATION STRATEGIES:** Research and general restoration strategies intended to restore commercial fishing are discussed under the individual commercial fishing resources including pink salmon, sockeye salmon, herring, and rockfish. No research or general restoration strategies have yet been identified for the 1995 work plan that restore commercial fishing directly without restoring a commercial fish resource.

### Common Murres

**Recovery** Status: Productivity of common murres show signs of recovery at some injured colonies (Barren Islands, Paule Bay) but post-spill population counts are still lower than pre-spill estimates and show no sign of recovery.

Recovery Objective: Common murres will have recovered when population trends are increasing significantly at index colonies in the spill area and when reproductive timing and success are within normal bounds. (Normal bounds will be determined by comparing productivity data with information from other murre colonies in the Gulf of Alaska and elsewhere.)

**RECOVERY MONITORING STRATEGY:** Populations at the Chiswell Islands, Barren Islands, Triplets, Ugaiushak Island and Puale Bay, the designated index colonies within the spill area, will be surveyed once every three years to determine if populations have recovered. Productivity will be monitored annually for four years at the Barren Islands to insure it is within normal bounds.

Monitoring Schedule: A complete population survey of injured colonies will be conducted every three years starting in 1996. Reproductive studies will be continued annually for four years, starting in 1995, then terminated if productivity is normal.

#### Estimated Recovery Time: 15-70 years.

**RESEARCH:** *Multiple-resource Research.* The high priority research issues for common murre are ecosystem processes: climate/oceanographic features, prey limitation and predation. Since the 1970s, murres along with other pelagic-feeding resources such as marbled murrelets, harbor seals, and other marine mammals and seabirds have been declining in the northern Gulf of Alaska and Prince William Sound. See Chapter 3: Pelagic Ecosystem, and the discussion of individual factors — climatic/oceanographic features, prey limitation, and predation.

*Research Specific to Murres.* Avian predation is considered a high priority issue for common murres. See Chapter 3: "Has predation increased?" Also a concern, but a lesser priority, is the question of whether behavioral changes in common murres have decreased breeding productivity at some colonies. See Chapter 3: "Behavior Change."

GENERAL RESTORATION: No general restoration strategies have been identified for the 1995 work plan. Restoration techniques to initiate recovery are unlikely until scientists have determined why common murres are not recovering.

### **Cutthroat** Trout

Recovery Status: Cutthroat trout have grown more slowly in oiled areas than in unoiled areas. Insufficient data are available to determine whether they are recovering.

**Recovery Objective:** Cutthroat trout will have recovered when growth rates within oiled areas are comparable to those for unoiled areas.

**RECOVERY MONITORING STRATEGY:** Monitor growth rates in injured populations to determine when the recovery objective has been met. Analysis of scale or otolith growth patterns may be a cost-effective approach to comparing current and past growth histories.

Monitoring Schedule: Every three years, continued at least one interval after the recovery objective has been met.

Estimated Recovery Time: Unknown

**RESEARCH:** No specific research issues were developed for the injured fish resources whose recovery status is unknown. Rather, the focus for cutthroat trout should be on determining if natural recovery is occurring.

GENERAL RESTORATION: Stock-separation information to help management protection is a useful but not high priority general restoration technique for cutthroat trout.

Conservative limits on sport-fish harvest of cutthroat trout have been adopted in Prince William Sound. These management measures are likely to continue until the fish recover from the spill. While recovery status is unknown, the impact of the protective measures could be minimized by management information that allows the Alaska Department of Fish and Game to vary harvest regulations by time or location to minimize incidental catch of the injured runs of cutthroat. This task typically involves some type of marking so that fisheries managers can determine the portion of the catch (at different locations and times) that originates from the different runs. This information is beyond that historically gathered by the department and would allow it to manage fishing to protect the injured runs — to minimize interference with natural recovery.

### **Designated Wilderness Areas**

Recovery Status: The oil spill delivered oil in varying quantities to the waters adjoining the seven areas within the spill area designated as wilderness (including wilderness study areas). Oil was also deposited above the mean high tide line in these areas. During the intense clean-up seasons of 1989 to 1990, hundreds of workers and thousands of pieces of equipment were at work in the spill area. This activity was an unprecedented imposition of people, noise, and activity on the area's undeveloped and normally sparsely occupied landscape.

Recovery Objective: Designated Wilderness Areas will have recovered when oil is no longer encountered in these areas and the public perceives them to be recovered from the spill.

**RECOVERY MONITORING, RESEARCH, AND GENERAL RESTORATION STRATEGIES:** Any restoration objective which aids recovery of injured resources, or prevents further injuries, will assist recovery of designated wilderness areas. No strategy has been identified that benefits designated wilderness areas without also addressing injured resources. For that reason, no monitoring specific to designated wilderness areas is proposed.

Monitoring Schedule: No monitoring specific to designated wilderness areas is proposed. However, monitoring the fate of the oil will continue to identify the existence and concentrations of *Exxon Valdez* oil in designated wilderness areas (For information about monitoring the presence of oil, see "Fate and Persistence of Oil" in this appendix.)

### Dolly Varden

**Recovery Status:** Dolly Varden have grown more slowly in oiled areas than in unoiled areas. Insufficient data are available to determine whether they are recovering.

**Recovery** Objective: Dolly Varden will have recovered when growth rates within oiled areas are comparable to those for unoiled areas.

**RECOVERY MONITORING STRATEGY:** Monitor growth rates in injured populations to determine when the recovery objective has been met. Analysis of otolith growth patterns may be a cost-effective approach to comparing current and past growth histories.

Monitoring Schedule: Every three years, continued at least one interval after the recovery objective has been met.

### Estimated Recovery Time: Unknown

**RESEARCH:** No specific research issues were developed for the injured fish resources whose recovery status is unknown. Rather, the focus for Dolly Varden should be on determining if natural recovery is occurring.

GENERAL RESTORATION: Stock-separation information to help management protection is a useful but not high priority general restoration technique for Dolly Varden.

Conservative limits on sport-fish harvest of Dolly Varden trout have been adopted in Prince William Sound. These management measures are likely to continue until the fish recover from the spill. While recovery status is unknown, the impact of the protective measures could be minimized by management information that allows the Alaska Department of Fish and Game to vary harvest regulations by time or location to minimize incidental catch of the injured runs of Dolly Varden. This task typically involves some type of marking so that fisheries managers can determine the portion of the catch (at different locations and times) that originates from the different runs. This information is beyond that historically gathered by the department and would allow it to manage fishing to protect the injured runs — to minimize interference with natural recovery.

### Harbor Seals

Recovery Status: Harbor seal numbers were declining in Prince William Sound (PWS) before the spill. Following the spill, seals in the oiled area had declined 43%, compared to 11% in the unoiled area. Counts made during the molt at trend count sites in Prince William Sound during 1990-1993 indicate that numbers may have stabilized. However, counts during pupping have continued to decline. It is not known which counts are the best indicator of

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population status. If the conditions that were causing the population to decline before the spill have improved, normal growth may replace the animals that were lost. However, if conditions continue to be unfavorable, the affected population may continue to decline. Harbor seals are a key subsistence resource in PWS and subsistence hunting is both affected by and may be affecting harbor seal status.

**Recovery Objective:** Recovery will have occurred when harbor seal populations trends are stable or increasing.

**RECOVERY MONITORING STRATEGY:** Aerial surveys of 25 trend count sites in PWS will be conducted during pupping and molting for comparison with previous years' data.

Monitoring Schedule: Aerial surveys will be conducted annually for the next 2 years. Periodicity of monitoring will be reevaluated after 1996, in light of population trend and indications of recovery. To date, it is not clear whether the population has stabilized in PWS or is continuing to decline. This species has declined more than 50% throughout the northern Gulf of Alaska and PWS in the last decade. It is currently being considered for listing as depleted under the Marine Mammal Protection Act. Data on current population status are necessary to avoid unnecessary regulation of fisheries in PWS and to provide information to subsistence hunters that will allow them to make informed decisions about levels of harvest. This monitoring program is very inexpensive to conduct.

Estimated Recovery Time: Unknown. If the ongoing decline is caused by food limitation or other unidentified factors that continue to be limiting, the population (including that segment that was damaged by the oil spill) may not recover.

**RESEARCH:** *Multiple-resource Research.* Harbor seal populations in PWS and the northern Gulf of Alaska have been declining for over a decade. The EVOS caused additional mortality in the spill area. In the four years since the EVOS, seal numbers have not shown any indication of recovery. In contrast, seals in southeast Alaska and Canada appear healthy and increasing. The reasons for the decline in the northern Gulf and PWS are unknown, but limited (or changing) availability of prey, particularly forage fishes, has been suggested as a cause for the decline. It is not possible, however, to eliminate other causes such as disease, predation by killer whales, harvest, or take by fisheries, or several of these factors in combination.

Of these factors, hypotheses relating to prey limitation, predations, and resource exploitation are high priority research areas for explaining the harbor seal decline. Specific research hypotheses include: (1) The decline in harbor seals in PWS (and the Gulf of Alaska) has occurred primarily because of changes in the availability of prey, particularly forage fishes; and (2) Predation by killer whales has caused or exacerbated the harbor seal decline, and/or prevented recovery. General issues considered important, but not as likely to explain the decline, include research on the definition of habitat effects and oceanographic processes on recruitment, growth, condition, and survival; and impacts of disease on harbor seals in

Prince William Sound. See Chapter 3: Pelagic Ecosystem, and discussion of individual factors — food limitation, and predation.

*Research specific to Harbor Seals.* Resource exploitation is a high priority issue for harbor seals. Harbor seal numbers are greatly reduced because of the area-wide decline, which was exacerbated by additional spill-related mortality. At this reduced level, the population may be impacted by any additional mortality, such as that caused by subsistence harvest or take associated with fisheries. See Chapter 2 discussion of "Resource Exploitation."

GENERAL RESTORATION: It would help restoration to determine if Prince William Sound animals are genetically distinct or different populations from those in the Gulf of Alaska or Southeast Alaska. This information about whether the populations are distinct or intermingle would be helpful in allowing subsistence hunters to assess the effects of their harvest. It would also be useful in understanding how the region-wide decline in harbor seals affects the population in the spill area.

### Harlequin Ducks

Recovery Status: There are indications of reduced densities of birds in the breeding season; a declining trend in the summer, post-breeding population; and very poor production of young in western Prince William Sound.

**Recovery** Objective: Harlequin ducks will have recovered when breeding and post-breeding season densities and production of young return to estimated prespill levels, or when there are no differences in these parameters between oiled and unoiled areas.

**RECOVERY MONITORING STRATEGY:** A survey that will provide an estimate of breeding-age adults to assess reproductive capability in the population and establish numerical recovery objectives will be conducted in 1995. After 1995, a May-June boat survey every three years should provide indications of change in the potential breeding population. Annual production of young is currently very low in the spill area and is normally highly variable in harlequin ducks. Annual monitoring is recommended for the next five years to confidently detect any signs of improvement amid expected fluctuations. Monitoring would be accomplished with a shoreline boat survey during late August and September, providing data on numbers of young, brood distribution, and abundance of post-breeding harlequins.

Monitoring Schedule: Conduct May-June breeding population survey every three years beginning in 1995. Conduct a production/post-breeding survey annually 1995-1999.

Estimated Recovery Time: Unknown. Intrinsic annual growth rates for harlequin duck populations may be 10% or less. Slow maturation and annually varying breeding propensity further inhibit population increase.

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**RESEARCH:** The breeding population of harlequin ducks in Western Prince William Sound has suffered consistent reproductive failure. The reasons for this chronic recruitment failure since the spill is unknown, but the leading hypothesis is that ingestion of oil-contaminated prey from foraging in oiled mussel beds has affected the reproductive success of the resident birds. This is a high priority issue for harlequin ducks. See discussion of individual factors in Chapter 3: "Direct Toxicity" and "Recruitment Processes."

GENERAL RESTORATION: In 1994, the Trustee Council funded the cleaning of contaminated mussel beds, primarily in Prince William Sound. If these mussel beds are the cause of the continued oil contamination and reproductive failure, the continued cleaning of any remaining contaminated mussel beds will be a continued high priority. The continuation of the 1994 project is dependent on the results of this summer's project.

### Intertidal Organisms

Recovery Status: The lower intertidal zone and, to some extent, the middle intertidal zone are recovering. However, injuries persist in the upper intertidal zone, especially on rocky sheltered shores. Recovery of this zone appears to depend, in part, on the return of adult <u>Fucus</u> in large numbers.

**Recovery Objective:** Each intertidal elevation (lower, middle, or upper) will have recovered when community composition, population abundance of component species, age class distribution and ecosystem functions and services in each injured intertidal habitat have returned to levels that would have prevailed in the absence of the oil spill.

**RECOVERY MONITORING STRATEGY:** Monitor selected matched oiled and non-oiled (control) sites throughout the spill area, incorporating a variety of habitats in each region. To validate the inference of recovery for the matched-pair design, matched non-oiled sites should be monitored also.

Monitoring Schedule: Monitor Prince William Sound paired sites in 1995 and 1997. Monitor Cook Inlet/Kenai Peninsula and Kodiak/Alaska Peninsula in 1996 and 1998. Further monitoring cycles should be dependent upon results of initial four years.

Approximately one-half of the site pairs would be within Prince William Sound and the other one-half in the other two regions combined. Because of the matched-pair design and the need to make comparisons within regions (which were shown to differ), a two-year monitoring cycle is necessary. This monitoring strategy provides continuity and level effort between years.

In addition, monitoring of Herring Bay intertidal sites will occur annually.

#### Estimated Recovery Time: Unknown

**RESEARCH:** The high priority research issues for the nearshore ecosystem including intertidal and subtidal organisms are ecosystem process questions. See Chapter 3: Nearshore Ecosystem, and Community Structure. See also discussion of other factors — predation, competition, and physical/oceanographic factors.

GENERAL RESTORATION: No general restoration strategies have yet been identified for the 1995 Work Plan.

### Killer Whales

Recovery Status: Thirteen whales disappeared from one pod in Prince William Sound between 1988 and 1990. The injured pod is growing again.

**Recovery** Objective: Killer whales will have recovered when the injured pod grows to at least 36 individuals (1988 level).

**RECOVERY MONITORING STRATEGY:** Photographs of individual killer whales occurring in AB pod will be collected to document natural recovery. Because AB pod whales frequently associate with other Prince William sound resident killer whale pods (approximately 80% of all encounters), it is necessary to photograph all killer whale pods/individuals encountered during field research in Prince William Sound.

Monitoring Schedule: Field research every two years will allow us to keep track of new births by year and record regrowth of the pod. Natality and mortality rates will be conservative biennial estimates, and missing whales will not be confirmed as dead until two years after they are first missing.

Estimated Recovery Time: Recovery of AB pod to pre-spill levels (36 whales) could take ten to fifteen years given the current age and sex structure of the population.

**RESEARCH AND GENERAL RESTORATION STRATEGIES:** No research or general restoration strategies have been identified for the 1995 Work Plan.

### Marbled Murrelet

**Recovery Status:** Marbled murrelet populations in Prince William Sound were in decline before the spill. The causes of the pre-spill decline are unknown.
**Recovery Objective:** Marbled murrelets will have recovered when population trends are increasing.

**RECOVERY MONITORING STRATEGY:** Estimate the Prince William Sound marbled murrelet population in July using standard U.S. Fish and Wildlife Service boat surveys.

Monitoring Schedule: Boat surveys of Prince William Sound bird populations should be conducted in the summer every three years starting in 1996.

#### Estimated Recovery Time: Unknown

**RESEARCH:** Multiple-resource Research. Research concerning ecosystem processes are high priority research issues for marbled murrelets: climatic/oceanographic features, prey limitation and predation. Since the 1970s, marbled murrelets along with other pelagicfeeding resources such as murres, harbor seals, and other marine mammals and seabirds have been declining in the northern Gulf of Alaska and Prince William Sound. See Chapter 3: Pelagic Ecosystem, and the discussion of individual factors — climatic/oceanographic features, prey limitation, and predation.

*Research Specific to Marbled Murrelets.* Avian and mammalian predation is considered a high priority issue for marbled murrelet. See Chapter 3: "Has predation increased?" Also a concern, but a lesser priority, is further research on the effects of resource exploitation (incidental gillnet catch) and upland development. However, protection of habitat remains an important strategy for protecting recovery. See Chapter 3: "Predation", and "Resource Exploitation."

GENERAL RESTORATION: No general restoration strategies have been identified for the 1995 work plan. Restoration techniques to initiate recovery are unlikely until scientists have determine why marbled murrelets are not recovering.

#### **Pacific Herring**

Recovery Status: Pacific herring studies have demonstrated egg mortality and larval deformities. Populations may have declined, but there is uncertainty as to the full extent and mechanism of injury. However, the stocks and dependent fisheries in Prince William Sound are not healthy, as indicated by the low spawning biomass in 1993 and 1994 and the resultant elimination of the fisheries in those years.

**Recovery** Objective: Pacific herring will have recovered when populations are healthy and productive and exist at prespill abundances.

**RECOVERY MONITORING STRATEGY:** Monitor fish health and spawning biomass. Annual monitoring for fish health status will begin in 1994. Estimation of spawning biomass will require support of annual spawn deposition survey to supplement normal ADF&G data collection.

Monitoring Schedule: Annual monitoring until recovery objectives have been met, that is when a healthy, strong year-class has recruited into the spawning population. Continued annual monitoring for four additional years (one recruitment cycle) beyond meeting the recovery objectives to ensure recovery has been achieved.

Estimated Recovery Time: Unknown; no sooner than 1996 (1992 year-class), which will require annual monitoring until at least 2000.

**RESEARCH:** *Multiple-resource Research.* Research on ecosystem processes including climatic/oceanographic features, prey limitation, and predation, is a high priority for understanding why herring and pink salmon are not recovering in Prince William Sound. A basic hypothesis for an ecosystem approach to determining how processes in the pelagic ecosystem may control fluctuations in these fisheries resources has been identified. This hypothesis is that mortality and growth of pink salmon and herring in Prince William Sound are controlled by the standing biomass of zooplankton, as influenced by atmospheric and oceanic processes. The average residence time of the Sound's waters and the strength of advective transport of deeper waters from the Gulf of Alaska into the Sound, control the standing biomass of zooplankton. When zooplankton are abundant, predation pressure on juvenile salmon and herring is relatively low, and survival of the juveniles is higher. If zooplankton abundance is low, predatory fish and birds switch from a zooplankton diet to juvenile salmon and herring, thus reducing survival of the juveniles.

Other ecosystem processes that are high priority for herring research include the advective transport of herring larvae from rearing areas in the Sound, and the quality of winter conditions on the survival and reproductive success of the herring population. See Chapter 3: Pelagic Ecosystem, and discussion of individual factors — physical/oceanographic features, prey limitations, and predation.

Research Specific to Herring. The continued investigation of the effects of previous exposure to oil is a high priority research area for herring. This exposure may have caused lethal and sublethal effects, and genetic damage to herring which may be inherited to succeeding generations. In addition, the effects of causes of viral hemorrhagic septicemia (VHS) is also a high priority research area. See Chapter 3: "Direct Toxicity," "Heritable Genetic Damage," and "Is it Disease?"

GENERAL RESTORATION: Stock separation information to help management protection is a high priority general restoration strategy for herring. The failure of the herring run in Prince William Sound in 1993 and 1994 prompted the Alaska Department of Fish and Game to close the fishery. Until the Sound-wide herring run is strong enough to support a commercial fishery, this closure will likely continue. During recovery, the impact of fishery management could be minimized by management information that allows the Alaska Department of Fish and Game to vary harvest regulations by time or location to minimize incidental catch of the injured runs of herring. This task typically involves stock separation so that fisheries managers can determine the portion of the catch (at different locations and times) that originates from the different runs. Marking programs and genetic stock identification are examples of management tools for stock separation. This information is beyond that historically gathered by the department and would allow it to manage fishing to protect the injured runs — to minimize interference with natural recovery. It allows this protection in a way that may allow earlier opening of the herring fishery in some parts of Prince William Sound. Unfortunately, stock separation about the technical feasibility of these techniques for herring.

#### Passive Use

Recovery Status: Passive use of resources includes the appreciation of the aesthetic and intrinsic values of undisturbed areas, the value derived from simply knowing that a resource exists, and other nonuse values. Injuries to passive uses are tied to public perceptions of injured resources.

Recovery Objective: Passive uses will have recovered when people perceive that aesthetic and intrinsic values associated with the spill area are no longer diminished by the oil spill.

RESEARCH, MONITORING, AND GENERAL RESTORATION STRATEGY: Any restoration activity that aids recovery of injured resources, or prevents further injuries, will assist recovery of passive-use values. No strategies have been identified which benefit only passive uses without also addressing injured resources. Since recovery of passive uses requires that people know when recovery has occurred, the availability to the public of the latest scientific information will continue to play an important role in the restoration of passive uses. At some point, the Trustee Council may wish to survey perceptions about recovery, but no specific passive use monitoring is proposed at this time.

Monitoring Schedule: At this time, no monitoring specific to passive use values is proposed.

Estimated Recovery Time: Unknown

#### Persistence of Oil (Intertidal Sediments, Mussels)

Oil itself is not an injured resource or service. It is the cause of the injuries. Monitoring the fate and persistence of oil in the environment including location, concentration, and toxicity provides foundation monitoring for remaining oil contamination in the ecosystem. It also provides specific recovery monitoring for continued contamination in sediments and mussels.

#### **Recovery Status:**

e

*Prince William Sound*. Limited shoreline surveys and limited clean-up work occurred in 1991, 1992, and 1993. The surveys indicated that subsurface oil remained at many sites that were heavily oiled in 1989.

In 1993, shoreline assessment surveys were conducted at over 75 sites in Prince William Sound. They found that oil residue was present at most sites and sheening occurred at some. They also found that surface oiling has become very stable. There was no measurable reduction in surface asphalt and surface oil residue from 1992 to 1993. Subsurface oiling, on the other hand, has decreased substantially since 1991. Overall, the amount of subsurface oil found at the study sites in 1993 is about 45% of the amount found in the same areas in 1991.

Kodiak. No sites have been surveyed on Kodiak Island since 1990.

- Alaska Peninsula. No general assessment work has been done since 1990. Five study sites were established in 1992 to examine the persistence and degradation of oil along national park coast lines. Those sites will be revisited in 1994. The 1992 observations indicate a continuing presence of oil at those sites.
- Cook Inlet and Outer Kenai Coast. Only limited assessment work has been done since 1990. A study site was established in 1992 to examine the persistence and chemical degradation of oil along national park coast lines. That site will be revisited in 1994. The 1992 observation indicates a continuing presence of oil at that site.

**Recovery Objective:** With respect to residual oil contamination, recovery has been achieved when remaining oil concentrations are reduced to a level comparable to pre-spill levels.

**RECOVERY MONITORING STRATEGY:** To assess the persistence of oil, monitoring needs to record the location, concentration, and characterization of oil that remains from the *Exxon Valdez* oil spill. Monitoring the location means periodically determining the areal extent until it reaches "recovery" levels in most areas, and focusing more frequent monitoring on "hot spots" where significant concentrations remain.

Monitoring Schedule:

- Kodiak and Alaska Peninsula. Comprehensive surveys have not been conducted since 1990. A survey should be conducted in 1995 to determine the areal extent and location of significant concentrations of remaining oil. The monitoring should be designed to give a comprehensive look at the distribution of oil in order to satisfy scientific and public information needs. Needs for future monitoring, if any, on Kodiak and the Alaska Peninsula will be determined based on the results from 1995.
- Prince William Sound. Specific areas in Prince William Sound were monitored in 1993. Monitoring is not needed in 1995. It should be conducted in 1996 to determine the location of significant concentrations of remaining oil. Like that for Kodiak and the Alaska Peninsula, the monitoring should be designed to give a comprehensive look at the distribution of oil in order to satisfy scientific and public information needs. It should not focus on known "hot spots" monitored in 1993, but be a broader effort to give a comprehensive picture. Future monitoring of specific remaining areas of high oil concentration will be determined based on the results from 1996.
- Cook Inlet and Outer Kenai Coast. Monitoring needs for Cook Inlet and outer Kenai Coast need not drive the monitoring schedule; rather, they should be incorporated into the projects for Kodiak and Prince William Sound as logistics opportunities are available.

Estimated Recovery Time: Unknown

RESEARCH: No research strategies have been identified for the 1995 Work Plan.

GENERAL RESTORATION: The 1994 Work Plan includes a project to accelerate the degradation of surface oil on beaches of important value to subsistence and recreation where the visual recognition of oil is diminishing these services. No strategies have been identified for the 1995 work plan.

Persistence of Oil (Mussel Beds)

Recovery Status: Mussels themselves are an injured resource, both from the recreational and subsistence view plus possibly as the vehicle for transferring petroleum hydrocarbons to higher consumers. High concentrations of petroleum hydrocarbons remain evident in some mussel beds within Prince William Sound, and preliminary results indicate contaminated beds outside Prince William Sound also.

Recovery Objective: Recovery will be complete when sediment petroleum hydrocarbons concentrations have declined to pre-spill concentrations.

**RECOVERY MONITORING STRATEGY:** Beds identified as contaminated should be monitored no more than once every three years. In order to maintain a level effort of work, one-third of these beds could be monitored each year.

Monitoring Schedule: Perform one cycle of monitoring, then re-evaluate.

Estimated Recovery Time: Unknown

**RESEARCH:** No research strategies have been identified for the 1995 Work Plan.

GENERAL RESTORATION: In 1994, the Trustee Council funded the cleaning of contaminated mussel beds, primarily in Prince William Sound. If these mussel beds are the cause of the continued oil contamination to harlequin ducks and other intertidal feeders, and reproductive failure to harlequin ducks, the continued cleaning of any remaining contaminated mussel beds will be a continued high priority. The continuation of the 1994 project is dependent on the results of this summer's project.

## Persistence of Oil (Subtidal Sediments)

**Recovery Status:** Subtidal organisms living in or on sediments and demersal fish that forage in subtidal sediment habitats may be exposed to the petroleum hydrocarbons that may be contaminating the sediments. In 1991, shallow subtidal PAH composition patterns consistent with that of weathered *EXXON VALDEZ* oil were found mainly at Northwest Bay in the depth range 3 - 20 m. Reduced concentrations of the oil were found at some shallow water stations in Bay of Isles, Herring Bay, and Snug Harbor. Data in 1992 and 1993 on the fish exposed showed evidence of continued contamination.

**Recovery Objectives:** Subtidal sediments will have recovered when concentrations of petroleum hydrocarbons in shallow (0 - 20 m) sediments approximate the petrogenic background concentration that prevailed prior to the *EXXON VALDEZ* oil spill and petroleum exposure indices in biota from oiled sites are similar to indices in biota from non-oiled sites.

**RECOVERY MONITORING STRATEGY:** Concentrations of hydrocarbons in shallow (0 - 20 m) subtidal sediments, and indices of petroleum exposure in flatfish will be monitored.

Monitoring Schedule: Sediments and biota should be monitored in 1995, and future monitoring should be dependent on 1995 results.

Estimated Recovery Time: Concentrations of petroleum hydrocarbons in shallow subtidal sediments are expected to recover to pre-oil spill levels in four to six years. Recovery time for biota exposure are not known

**RESEARCH AND GENERAL RESTORATION STRATEGIES:** No research or general restoration strategies have been identified for the 1995 work plan.

#### **Pigeon Guillemot**

Recovery Status: The pigeon guillemot population in Prince William Sound was in decline before the spill. The causes of the prespill decline are unknown.

Recovery Objective: Pigeon guillemots will have recovered when populations are stable or increasing.

**RECOVERY MONITORING STRATEGY:** Estimate the Prince William Sound pigeon guillemot population in winter and summer using standard US Fish and Wildlife Service boat surveys.

Continue June counts of pigeon guillemots attending colonies on Naked, Peak, Storey, Smith and Little Smith islands. The Naked Island area supports greater than 25% of Prince William Sound guillemots, and pre-spill and post-spill counts of the Naked Island area population provide excellent data for determining population trend. These data will provide an independent source of information to confirm trends found in the boat surveys.

Monitoring Schedule: Boat surveys of Prince William Sound bird populations should be conducted in winter and summer every three years starting in 1996. June counts of guillemots in the Naked Island area should be conducted every three years.

Estimated Recovery Time: Unknown

**RESEARCH:** Multiple-resource Research. Research concerning ecosystem processes are high priority research issues for pigeon guillemot: climatic/oceanographic features, prey limitation and predation. Since the 1970s, pigeon guillemot along with other pelagic-feeding resources such as marbled murrelets, harbor seals, and other marine mammals and seabirds have been declining in the northern Gulf of Alaska and Prince William Sound. See Chapter 3: Pelagic Ecosystem, and the discussion of individual factors — climatic/oceanographic features, prey limitation, and predation.

*Research Specific to Pigeon Guillemots.* Predation of eggs and nestlings is an alternative but lower priority hypothesis for the lack of pigeon guillemot recovery. Mammalian predation is considered an only moderately important research issue for pigeon guillemots.

In the initial years of the spill, oil was found on eggs. Investigating the lingering effects of this oiling is considered only a moderate priority research hypothesis in explaining the lack of recovery. In addition, resource exploitation (e.g., incidental gillnet catch) is unlikely to

explain the continued area-wide decline, and may have a potentially significant impact on recovery. See Chapter 3: "Direct Toxicity," "Is it Predation?" and "Resource Exploitation."

GENERAL RESTORATION: No general restoration strategies have been identified for the 1995 Work Plan.

#### Pink Salmon

**Recovery Status:** Pink salmon studies have demonstrated egg mortality, fry deformities, and reduced growth in juveniles. Populations may have declined, but there is uncertainty as to the full extent and mechanism of injury. However, there is evidence of continued damage in some stocks from exposure to oil, and there has been a precipitous decline to both wild and hatchery stocks of pink salmon in Prince William Sound since 1991.

Recovery Objective: Pink salmon will have recovered when populations are healthy and productive and exist at prespill abundance (an indication of recovery is when egg mortalities in oiled areas match prespill level or levels in unoiled areas.)

**RECOVERY MONITORING STRATEGY:** (1) Annual monitoring of egg mortality in a standardized set of oiled and non-oiled streams. (2) Monitoring of escapements and return per spawner productivity. ADFG routinely monitors escapements throughout PWS as part of its management program; an additional increment of stock separation in the commercial fishery is necessary to accurately determine hatchery/wild stock fishery contributions, in order to estimate returns per spawner. This additional increment may be provided by higher-resolution management activities required as general restoration activity to ensure adequate escapement of impacted populations of pink salmon.

Monitoring Schedule: Annual monitoring until recovery objectives have been met, and for the subsequent generation (two years) after recovery objectives have been met to ensure recovery has been achieved.

Estimated Recovery Time: Unknown; at least two generations, depending on the mechanism of damage to reproductive success.

**RESEARCH:** *Multiple-resource Research.* Research on ecosystem processes including climatic/oceanographic features, prey limitation, and predation, is a high priority for understanding why herring and pink salmon are not recovering in Prince William Sound. A basic hypothesis for an ecosystem approach to determining how processes in the pelagic ecosystem may control fluctuations in these fisheries resources has been identified. This hypothesis is that mortality and growth of pink salmon and herring in Prince William Sound are controlled by the standing biomass of zooplankton, as influenced by atmospheric and oceanic processes. The average residence time of the Sound's waters and the strength of

advective transport of deeper waters from the Gulf of Alaska into the Sound control the standing biomass of zooplankton. When zooplankton are abundant, predation pressure on juvenile salmon and herring is relatively low, and survival of the juveniles is higher. If zooplankton abundance is low, predatory fish and birds switch from a zooplankton diet to juvenile salmon and herring, thus reducing survival of the juveniles.

Research on the impacts of large-scale enhancement of pink salmon in Prince William Sound on the recovery and productivity of wild populations of pink salmon is also a high priority. See Chapter 3: Pelagic Ecosystem, and discussion of individual factors climatic/oceanographic features, prey limitations, predation, and impact of hatcheries.

*Research Specific to Pink Salmon.* The continued investigation of the effects of previous exposure to oil a high priority research area for pink salmon. This exposure may have caused lethal and sublethal effects, and genetic damage to pink salmon which may be inherited to succeeding generations. See Chapter 3: "Direct Toxicity," and "Heritable Genetic Damage."

GENERAL RESTORATION: Stock-separation information to help management protection is a high priority general restoration technique for pink salmon.

The poor returns of the pink salmon runs in Prince William Sound in 1992 and 1993 have prompted the Alaska Department of Fish and Game to restrict the fishery. Fishermen harvest both injured and healthy pink salmon runs. There is a need for more information to allow the Alaska Department of Fish and Game to vary harvest regulations by time or location to minimize incidental catch of the injured runs of pink salmon. This task typically involves some type of marking so that fisheries managers can determine the portion of the catch (at different locations and times) that originates from the different runs. This information is beyond that historically gathered by the department and would allow it to manage fishing to protect the injured runs — to minimize interference with natural recovery.

#### **Recreation and Tourism**

Recovery Status: The spill disrupted use of the spill area for recreation and tourism. Resources important for wildlife viewing include killer whale, sea otter, harbor seal, bald eagle, and various seabirds. Residual oil exists on some beaches with high value for recreation. It may decrease the quality of recreational experiences and discourage recreational use of these beaches.

Closures on sport hunting and fishing also affected use of the spill area for recreation and tourism. Sport fishing resources include salmon, rockfish, Dolly Varden, and cutthroat trout. Harlequin duck are hunted in the spill area.

Recreation was also affected by changes in human use in response to the spill. For example, displacement of use from oiled areas to unoiled areas increased management problems and facility use in unoiled areas. Some facilities like the Green Island cabin and the Fleming Spit camp area were injured by clean-up workers.

**Recovery Objective:** Recreation and tourism will have recovered, in large part, when the fish and wildlife resources on which they depend have recovered, recreation use of oiled beaches is no longer impaired, and facilities and management capabilities can accommodate changes in human use.

**RECOVERY MONITORING STRATEGY:** Stay advised of the recovery status of the resources upon which recreation activities depend. Interaction with the recreation user groups will be maintained by requiring oil spill funded resource projects to monitor recreation use in the project area. Identify oiled beaches which have or have had high attraction for recreation use where evidence persists as surface or subsurface oil. The 1991 Forest Service Customer Survey will be redone periodically to establish recovery trends.

Monitoring Schedule: Resource monitoring activities that relate to recreational use of the oil spill area will be scheduled as the scientists determine, and the data will be used by the agencies to monitor resource use-based recreation. Beaches with persistent oil will be monitored annually in mid-summer. The Customer Survey will be repeated in 1995, and three and six years hence, in an attempt to establish recovery and trend information.

Estimated Recovery Time: Use statistics are currently higher than for pre-spill years, but people express that oiled areas are not the same as they were pre-spill is prevalent. Continue beach monitoring as long as residual oil persists. When perception of oiling will be insignificant among recreationists is unknown.

**RESEARCH AND GENERAL RESTORATION STRATEGIES:** No research and general restoration strategies have been identified for the 1995 Work Plan.

#### **River Otters**

**Recovery Status:** River otters have suffered sublethal effects from the spill and continuing exposure to hydrocarbons.

**Recovery Objectives:** Indications of recovery are when habitat use, food habitats, and physiological indices have returned to prespill conditions.

**RECOVERING MONITORING STRATEGY:** Monitor latrine sites for use by otters and reestablish use of abandoned sites to indicate populations recovery. Monitor species composition in feces to document return to prespill composition.

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Monitoring Schedule: Two field trips yearly early summer and late summer.

Estimated Recovery Time: River otters are long-lived species; best case scenario - 15 years.

**RESEARCH AND GENERAL RESTORATION STRATEGIES:** No research and general restoration strategies have been identified for the 1995 work plan.

#### Rockfish

Recovery Status: Dead adult rockfish were recovered following the oil spill. Other rockfish were exposed to hydrocarbons and showed sublethal effects. Furthermore, closures to salmon fisheries increased fishing pressures on rockfish which may be affecting their population. However, the extent and mechanism of injury to this species are unknown.

Recovery Objective: Without further study, recovery cannot be defined.

**RECOVERY MONITORING STRATEGY:** No monitoring strategy can be determined without definition of a recovery objective. Synthesis of NRDA studies and other data on PWS rockfish is needed, with recommendations for recovery objective and monitoring approach a requirement of the synthesis project.

Monitoring Schedule: None

Estimated Recovery Time: Unknown

**RESEARCH AND GENERAL RESTORATION STRATEGIES:** The only research or general restoration task that has been identified for rockfish is synthesis of the available information in order to determine if restoration is needed.

#### Sea Otters

Recovery Status: Sea otters do not appear to be recovering, but are expected to eventually recover to their prespill population. Exactly what population increases would constitute recovery is very uncertain, as there is no population data from 1986 to 1989, and the population may have been increasing in Eastern Prince William Sound during that time. In addition, only large changes in the population can be reliably detected with current measuring techniques. However, there are recent indications that the patterns of juvenile and mid-aged mortalities are returning to prespill conditions.

**Recovery Objective:** Sea otters will be considered recovered when population abundance and distribution are comparable to prespill abundance and distribution, and when all ages appear healthy.

**RECOVERY MONITORING STRATEGY:** The recovery monitoring program will track abundance and mortality of sea otters in oiled areas.

<u>Abundance</u>. Aerial surveys of sea otter abundance in areas of Prince William Sound most heavily impacted by the oil spill (areas around northern Knight Island and Naked Island) and in non-oiled areas of western PWS will be conducted in 1995 and 1997 and thereafter only if the number of sea otters in oiled areas remains lower than anticipated. Data on sea otter abundance collected as part of the seabird boat surveys will continue to be collected in the process of monitoring seabirds (at no extra cost to either the seabird or sea otter projects), and will be used to augment the aerial survey data on sea otter abundance in oiled areas. However, the aerial surveys have been developed specifically to provide accurate counts of sea otters whereas the boat surveys will be relied upon only as supplementary information.

<u>Mortality</u>. Sea otter carcasses will be collected in oiled areas of Prince William Sound (the Green Island area) in the spring of 1995 and 1996. Ages of the otters at the time of death can be determined from the skulls. Pre-spill data on carcasses from this area indicated the proportion of prime-age otters in the carcass sample is normally low. However, mortality of prime-age otters was high post-spill, through 1991. Since then, mortality patterns appear to be returning to normal. Two more seasons of carcass collection will allow us to confirm that mortality patterns in the population are similar to prespill. An advantage of assessing mortality through collection of carcasses is that the work can be completed in a short time at a relatively low cost.

#### **Monitoring Schedule:**

1995	- \	Aerial surveys, Carcass collection
1996		Carcass collection
1997		Aerial surveys
1998	- 1	Only if data collected in 1996 suggests recovery is not occurring
1999		Aerial surveys, if needed
2001		Aerial surveys, if needed

Monitoring Schedule Justification: Unusually low densities of sea otters have been observed in heavily oiled areas of PWS and no increases have been detected since the spill. Maximum annual growth rates in sea otter populations are 0.21. Based on an estimated annual increase of 0.10 and  $\alpha$  and  $\beta = 0.20$ , a significant difference between two bi-annual surveys could be detected. If the annual change is 0.05, three surveys (1995, 1997, 1999) would be required to detect statistical significance.

Estimated Recovery Time: Unknown. No increase in population size has been observed since the spill.

**RESEARCH:** For sea otters, high priority is given to questions focused on the continued impacts of oiling, both by direct toxicity and altered community structure, and on prey limitation on recovery. Specific research hypotheses relative to these factors are: (1) direct exposure to hydrocarbons and ingestion of contaminated prey has impacted current or future survival and reproductive success of sea otters in Prince William Sound; and (2) the oil spill induced changes in population of benthic prey species that have limited re-occupation of sea otter habitat and the recovery of sea otters in oiled areas. See Chapter 3: Nearshore Ecosystem, and discussion of individual factors — community structure, direct toxicity and prey limitations.

GENERAL RESTORATION STRATEGIES: No general restoration strategies have been identified for the 1995 work plan.

#### Sockeye-Salmon

**Recovery Status:** Sockeye salmon in Red Lake, Akalura Lake, and lakes in the Kenai River system declined in population because of adult overescapement in 1989. The Red Lake system may be recovering because the plankton has recovered, and fry survival improved in 1993. However, Akalura Lake and Kenai River Lakes have not recovered: smolt production has continued to decline from these lakes. In the Kenai River lakes, for example, smolt production has declined from 30 million in 1989 to 6 million in 1990, and to less than 1 million in 1992 and 1993.

**Recovery Objective:** Sockeye salmon in the impacted lakes will have recovered when populations are able to support overwinter survival rates and smolt outmigrations comparable to prespill levels.

**RECOVERY MONITORING STRATEGY:** In Red Lake and Akalura Lake, monitoring of smolt outmigrations. In Kenai River lakes, monitoring of fall fry abundance and smolt abundance to estimate overwinter survival and smolt production.

Monitoring Schedule: Annually until recovery objectives have been met, and for two subsequent years after smolt productivity has returned to normal. Thus two more years of monitoring at Red Lake are required to confirm recovery, while at least seven years of monitoring will be necessary at Kenai and Akalura Lake to monitor productivity through returns of year-classes damaged by spill-induced overescapements.

Estimated Recovery Time: For Akulara Lake and Kenai River lakes, recovery time is unknown, but is believed to be a minimum of seven years. Red Lake may be considered fully recovered in two years.

**RESEARCH:** High priority research concerning sockeye salmon entirely concern ecosystem processes. See Chapter 3: Upland Ecosystem, and discussion of individual factors — community structure, prey limitation, predation, and competition.

GENERAL RESTORATION: Stock-separation information to help management protect injuried sockeye salmon is a high priority general restoration technique.

The diminished sockeye salmon smolt production in the Kenai and Kodiak area lakes is likely to prompt the Alaska Department of Fish and Game to restrict the fishery. Fishermen harvest both injured and healthy sockeye salmon runs. There is a need for more information to allow the Alaska Department of Fish and Game to vary harvest regulations by time or location to minimize incidental catch of the injured runs. This task typically involves some type of marking so that fisheries managers can determine the portion of the catch (at different locations and times) that originates from the different runs. This information is beyond that historically gathered by the department and would allow it to manage fishing to protect the injured runs — to minimize interference with natural recovery.

#### Subsistence

**Recovery Status:** Subsistence users say that maintaining their subsistence culture depends on uninterrupted use of subsistence resources. The more time users spend away from subsistence activities, the less likely they will return to the activities. Continuing injury to natural resources used for subsistence may affect the way of life of entire communities.

**Recovery Objective:** Subsistence will have recovered when injured subsistence resources are healthy and productive and exist at prespill levels and people are confident that the resources are safe to eat. One indication that recovery has occurred is when the cultural values provided by gathering, preparing, and sharing food are reintegrated into community life.

**RECOVERY MONITORING STRATEGY:** Other than completion of laboratory sample analysis and result reporting to Native Villages, no new samples will be collected through FY95. Harlequin duck and harbor seal monitoring studies (see each resource above) are important for promoting confidence of subsistence users in wild foods.

Monitoring Schedule: See above

Estimated Recovery Time: To be determined

Appendix A: Draft Objectives and Strategies

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**RESEARCH AND GENERAL RESTORATION STRATEGIES:** Some research and general restoration strategies intended to restore subsistence are included under the individual commercial fishing resources including pink salmon, sockeye salmon, herring, and harbor seals.

Other Research Priorities for FY 95 include clam recruitment projects. Subsistence users are reporting smaller and fewer clams at some sites previously used for subsistence gathering.

General Restoration Priorities for FY 95 include completion of 94279, Subsistence Food Safety Testing, including laboratory analysis of 1994 samples. Result reporting through newsletters and community followup meetings will be needed to accomplish the goals of this project. The newsletter will include all that was reported in other Trustee Council sponsored projects that have information which applies to subsistence communities.

Project 94272, Chenega Chinook Salmon Release, will continue for another 4 years. Project 94244, Harbor Seal and Sea Otter Cooperative Subsistence Harvest Assistance, will need to continue in order to meet project goals.

## Subtidal Organisms

Recovery Status: Certain subtidal organisms, like eelgrass and some species of algae, appeared to be recovering. Other subtidal organisms, like leather stars and helmet crabs, showed little signs of recovery.

Recovery Objective: Subtidal communities will have recovered when the community composition, age class distribution population abundance of component species, and ecosystem functions and services in each injured subtidal habitat have returned to levels that would have prevailed in the absence of the oil spill.

**RECOVERY MONITORING STRATEGY:** Focus on the eelgrass community in Prince William Sound. A matched-pair design is recommended.

Monitoring Schedule: Eelgrass sites should be monitored in 1995. Further monitoring should be dependent upon the results of this 1995 effort.

Estimated Recovery Time: Unknown

**RESEARCH:** The high priority research issues for the nearshore ecosystem, including intertidal and subtidal organisms, are entirely ecosystem process questions. See Chapter 3: Nearshore Ecosystem, and Community Structure. See also discussion of other factors — predation, competition, and climatic/oceanographic factors.

GENERAL RESTORATION: No general restoration strategies have yet been identified for the 1995 Work Plan.

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No.	Title	Agency	<u>Status</u>	<u>FY 94 Budget (\$ 000s)</u>
General	Restoration			
94007	Site Specific Archaeological Restoration	ADNR	94007A - this represents completion of the 1993 field work. The draft report has been turned in to NPS, the lead agency. Sediment samples have been submitted to NPS for transmittal to Auke Bay laboratory. 94007B - this represents the FY 94 project. Detailed Project Description work plan has been submitted.	599.5
94041	Introduced Predator Removal from Islands	DOÍ	Detailed Project Description under review.	84.0
94043	Cutthroat and Dolly Habitat Restoration In Prince William Sound	USFS	Detailed Project Descriptions for instream restoration sub-projects in preparation.	3.5 (NEPA only, combined with 94139)
94090	Mussel Bed Restoration and Monitoring	NOAA	Project continuing. Detailed project description submitted for review.	681 1
94137	Stock Identification of Chum, Sockeye, Chinook, and Coho Salmon in Prince WIlliam Sound	ADFG	FY 93 report in preparation, preparing for FY 94 field season.	261 6
94139	Salmon Instream Habitat and Stock Restoration	USFS	Little Waterfall Barrier Detailed Project Description submitted. DPDs for other sub-projects in preparation.	761 3

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<u>No.</u>	Title	Agency	Status	FY 94 Budget (\$ 000s)
94166	Herring Spawn Deposition and Reproductive Impairment	ADFG	ADF&G - in preparation for FY 94 field season. NOAA - laboratory experiment begun at Auke Bay laboratory. Detailed Project Description for FY 94 submitted for review.	466.3
<b>94184</b>	Coded Wire Tag Recoveries from Pinks in Prince William Sound	ADFG	FY 93 report at peer review, preparing for FY 94 field work under budget for 94320.	47.8
94185	Coded Wire Tagging of Wild Pinks for Stock Identification	ADFG	Further work on project deferred from FY 94 Work Plan.	34.8
94191	Oil Related Egg and Alevin Mortalities	ADFG	ADF&F - FY 93 report in preparation, preparing for FY 94 field season. NOAA - project continues with two broods being raised until adults. Detailed Project Description submitted for review.	782 9
94217	Prince William Sound Area Recreation Implementation	USFS	Writing final report. ADNR - final report has been submitted to Chief Scientist for peer review.	76 3
94244	Harbor Seal and Sea Otter Co-op Subsistence Harvest Assistance	ADFG	Detailed Project Description completed Planning for field season in progress.	54.5
94259	Coghill Lake Sockeye Salmon Restoration	ADFG	Data analysis/report writing in progress, preparing for FY 94 field season	324.1
94266	Shoreline Assessment and Oil Removal	ADEC	Planning underway	403 1

APPENDIX B - 1994 Restoration Projects



No.	Title	Agency	<u>Status</u>	<u>FY 94 Budget (\$ 000s)</u>
94272	Chenega Chinook Release Program	ADFG	Detailed Project Description completed. Planning for FY 94 field season in progress	57.4
94279	Subsistence Food Safety Testing	ADFG	ADF&G - completed community meetings and newsletter FY 93 report in preparation, and preparing for FY 94 field season. NOAA - will analyze samples collected in 1994 field season.	379 2
94417	Waste Oil Disposal Facilities	ADEC	Planning underway.	232 2
94504	Genetic Stock Identification of Kenai River Sockeye	ADFG	Analyzing FY 93 data/report writing in progress, preparing FY 94 field work as part of 94255.	262.2
94507	Symposium Proceedings Publication	NOAA	Project continuing 57 manuscripts in peer review. ADEC preparing contract documents.	69.0
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Habitat	<b>Protection &amp; Acquisition</b>	^{ال} م الله . م م		
94110	Habitat Protection - Data Acquisition and Support	ADNR	Large parcel evaluation and ranking published November 30, 1993 Work continuing on development of small parcel process. Work continuing with reconfiguration of large parcels in support of negotiators	678.7
94126	Habitat Protection and Acquisition Fund	ADNR	Work continues in support of negotiations conducted by Department of Law on behalf of the Trustee Council	1160 3
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APPENDIX B - 1994 Restoration Projects

# **APPENDIX B - 1994 Restoration Projects**

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Exxon Valdez Oil Spill Trustee Council Project Status Summary - 1994 Work Plan (Quarter Ending March 31, 1994)

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No.	Title	Agency	Status	<u>FY 94 Budget (\$ 000s)</u>
94505	Information Needs for Habitat Protection	USFS	ADF&G - FY 93 report at peer review, no FY 94 field work funded in FY 94 Work Plan. USFS - marbled murrelet - draft report to Chief Scientist 4/22/94. Channel Typing - draft report to Chief Scientist 5/22/94.	406 1
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Monitor	ing and Research	·		r +
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94020	Black Oystercatcher Interaction with Intertidal	DOI	Report writing in progress	17.3
94039	Common Murre Population Monitoring	DOI	Report writing in progress.	227.2
94064	Harbor Seal Habitat Use and Monitoring	ADFG	Satellite transmitters ordered and in preparation for FY 94 field season. FY 93 report at peer review.	270.2
94066	Harlequin Duck Recovery Monitoring	ADFG	ADF&G - report in preparation, project as proposed not funded for field work in FY 94. NOAA - hydrocarbon samples analyzed and results submitted to ADF&G.	139 3
94086	Herring Bay Experimental and Monitoring Studies	ADFG	Preparing FY 93 report and planning for FY 94 field season.	729 4
94092	Killer Whale Recovery Monitoring	NOAA	Report due April 1994. No field work in FY 94	33.7

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<u>No.</u>	Title	Agency	Status	FY 94 Budget (\$ 000s)
94102	Marbled Murrelet Prey and Foraging Habitat in Prince William Sound	DOI	Field preparations in progress.	231.5
- 94159	Marine Bird & Sea Otter Boat Surveys	DOI	Field work completed in March.	107.0
94163	Forage Fish Influence on Recovery of Injured Species	NOAA	DPD and RFP for project in preparation.	606.6
94165	Herring Genetic Stock Identification in Prince William Sound	ADFG	Project deferred pending review and acceptance of herring damage assessment studies.	62.2
94173	Pigeon Guillemot Recovery Monitoring	DOI	Detailed Project Description submitted for review.	201.1
94199	Institute of Marine Science - Seward Improvements	ADFG	Environmental Impact Statement in progress.	50. <b>0</b>
94246	Sea Otter Recovery Monitoring	DOI	Field preparations in progress.	207.4
94255	Kenai River Sockeye Salmon Restoration	ADFG	FY 93 report in preparation, preparing for FY 94 field season.	406.1
94258	Sockeye Salmon Overescapement	ADFG	Analyzing winter data for FY 93 report, preparing for FY 94 field season.	854 9

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<u>No.</u>	Title	Agency	Status	<u>FY 94 Budget (\$ 000s)</u>
94285	Subtidal Sediment Recovery Monitoring	NOAA	ADEC - see project 93047-2 ADF&G - FY 93 report in preparation, not funded for field work in FY 94 Work Plan. NOAA - vessel charter contracting underway. Detailed Project Description submitted for review	629 2
94290	Hydrocarbon Data Analysis and Interpretation	NOAA	Continuing project - update and quality control of hydrocarbon data. Detailed Project Description submitted for review.	130.2
94320	PWS System Investigation	ADFG	RSA, NEPA compliance, and FY 94 field season preparation in progress. Review of Detailed Project Descriptions for 94320 sub-projects. DNR component of project is complete.	6350.0
94422	Environmental Impact Statement for the Draft Restoration Plan	USFS	DNR LRIS is working with EIS group to produce maps for DRAFT EIS report due in May.	343.4
94425	Marine Mammal Book	NOAA	Book in final editing. Scheduled for printing in late summer	20.0
94506	Pigeon Guillemot Recovery	DOI	Report writing in progress.	13.9
Restorat	tion Reserve	ŗ		
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94424	Restoration Reserve	DOL	Under review by Department of Justice	12,000`0
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APPENDIX B - 1994 Restoration Projects

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## Appendix C

List of Workshop Participants

The individuals listed in this appendix participated in a workshop sponsored by the Trustee Council in Anchorage, April 13-15, 1994. These individuals worked together to identify and prioritize research and monitoring issues needed for the 1995 restoration program. The recommendations of this workshop are the monitoring and research recommendations included in Chapter 3 of this Invitation to Submit Restoration Projects.

Bud Antonelis NMFS, NMML 7600 Sand Point Way, N.E. Seattle, WA 98115

James R. Ayers Executive Director EVOS Trustee Council P.O. Box 20122 Juneau, AK 99802

Torie Baker Cordova District Fishermen United POB 1159 Cordova, AK 99574

Brenda Ballachey NBS Marine Mammals/Sea Otters 1011 E Tudor Road Anchorage, AK 99503

Ted Birkedal National Park Service 2525 Gambell Street Anchorage, AK 99503

Judy Bittner Alaska Dept of Natural Resources P.O. Box 107001 Anchorage, AK 99510

Chris Blackburn Alaska Groundfish Databank P.O. Box 2298 Kodiak, AK 99615

Jim Bodkin National Biological Survey 1011 E Tudor Road Anchorage, AK 99503 Mark Brodersen Alaska Dept of Environmental Conservation 410 Willioughby, Room 105 Juneau, AK 99801-1795

Evelyn Brown Alaska Dept of Fish & Game POB 669 Cordova, AK 99574-0669

Fred Clark USDA Forest Service 3301 C Street Anchorage, AK 99503

Tracy Collier NOAA-NMFS, N.W. Fisheries Science Center 2725 Montlake Boulevard E. Seattle, WA 98112

R. Ted Cooney Institute of Marine Science University of Alaska, Fairbanks Fairbanks, AK 99775-1080

Joel Cusick NPS Coastal Programs 2525 Gambell Street Anchorage, AK 99503

Marilyn Dahlheim NMFS-NMML 7600 Sand Point Way N.E., Building 4 Seattle, WA 98115

Thomas Dean Coastal Resources Associates 1185 Park Center Drive Vista, CA 92083 James Diehl Knik Canoers and Kayakers Box 868 Girdwood, AK 99587

David Duffy Alaska Natural Heritage Program University of Alaska 707 A Street Anchorage, AK 99501

Dan Esler National Biological Survey 1011 E Tudor Road Anchorage, AK 99503

L.J. Evans Alaska Dept of Fish & Game EVOS Trustee Council 645 G Street, Suite 401 Anchorage, AK 99501-3451

Donna Fischer City of Valdez POB 395 Valdez, AK 99686

John French Fishery Industrial Technology Center 900 Trident Way Kodiak, AK 99615

Kathryn Frost Alaska Dept of Fish & Game 1300 College Road Fairbanks, AK 99701

Dave Gibbons US Forest Service 709 West 9th Street, Room 549 Juneau, AK 99801-1628

Veronica Gilbert AK Dept of Natural Resources EVOS Trustee Council 645 G Street, Suite 401 Anchorage, AK 99501-3451

Chris Habicht Alaska Dept of Fish & Game 333 Raspberry Road Anchorage, AK 99518 Scott Hatch NBS Alaska Research Center 1011 E Tudor Road Anchorage, AK 99503

Ray Highsmith Institute of Marine Science University of Alaska, Fairbanks Fairbanks, AK 99775-1080

Ken Hill POB 1290 Cordova, AK 99574

Leslie Holland-Bartels NBS Alaska Fish & Wildlife Research Center 1011 E Tudor Road Anchorage, AK 99503

Andy Hooten Coastal Resource Association, Inc. 4005 Glenridge Street Kensington, MD 20895

David Irons USFWS 1011 E. Tudor Road Anchorage, AK 99503

Gail Irvine National Biological Survey 2525 Gambell Street Anchorage, AK 99503

Ken Krieger NMFS Auke Bay Laboratory POB 210029 Auke Bay, AK 99821

Rod Kuhn US Forest Service EVOS Trustee Council 645 G Street, Suite 401 Anchorage, AK 99501-3451

Kathy Kuletz 1633 W. 15th Avenue, #2 Anchorage, AK 99501-4909

Appendix C: List of Workshop Participants

Bob Loeffler AK Dept of Environmental Conservation EVOS Trustee Council 645 G Street, Suite 401 Anchorage, AK 99501-3451

Molly McCammon Director of Operations EVOS Trustee Council 645 G Street, Suite 401 Anchorage, AK 99501-3451

Vern C. McCorkle P.O. Box 242188 Anchorage, AK 99524-1288

Dennis Marks US Fish & Wildlife Service 1011 E Tudor Road Anchorage, AK 99503

Craig Matkin North Gulf Oceanic Society POB 15244 Homer, AK 99603-6284

Theo Matthews POB 389 Kenai, AK 99611

Jerome Montague Alaska Dept of Fish & Game 1255 W 8TH Street Juneau, AK 99802-5526

Byron Morris US Dept of Commerce - NOAA POB 210029 Auke Bay, AK 99821

Eric Myers Alaska Dept of Fish & Game EVOS Trustee Council 645 G Street, Suite 401 Anchorage, AK 99501-3451

Brenda Norcross Institute of Marine Fisheries 200 O'Neil Building Fairbanks, AK 99775-1090 Karen Oakley USFWS Div of Environmental Containments 1011 E Tudor Road Anchorage, AK 99503

Charles O'Clair Auke Bay Laboratory 11305 Glacier Highway Auke Bay, AK 99821

Samuel Patten Alaska Dept of Fish & Game 333 Raspberry Road Anchorage, AK 99518

A.J. Paul POB 1197 Seward, AK 99664

Jeep Rice NOAA/NMFS Auke Bay Fisheries Laboratory 11305 Glacier Highway Auke Bay, AK 99821

Dan Rosenberg Alaska Dept of Fish & Game 333 Raspberry Road Anchorage, AK 99518-1599

D.G. Roseneau Alaska Maritime National Wildlife Refuge 2355 Kachemak Bay Drive, Suite 101 Homer, AK 99603-8021

Tom Rothe Alaska Dept of Fish & Game 333 Raspberry Road Anchorage, AK 99518

David Salmon Prince William Sound Science Center POB 705 Cordova, AK 99574

David Scheel PWS Science Center POB 705 Cordova, AK 99574 Dana Schmidt Alaska Dept of Fish & Game 34828 Kalifornsky Beach Road, Suite B Soldotna, AK 99669-3150

Robert Shaw Alaska Dept of Natural Resources P.O. Box 108001 Anchorage, AK 99510

Jeffrey Short NMFS - Auke Bay Laboratory 11305 Glacier Highway Auke Bay, AK 99821

Robert Spies Applied Marine Sciences POB 824 Livermore, CA 94550

Michael Stekoll School of Fisheries & Ocean Sciences 11120 Glacier Highway Juneau, AK 99801

Joe Sullivan Alaska Dept of Fish & Game 333 Raspberry Road Anchorage, AK 99518

Ray Thompson USDA Forest Service 3301 C Street, Suite 300 Anchorage, AK 99503

Martha Vlasoff POB 169 Tatitlek, AK 99677

Alex Wertheimer NMFS Auke Bay Laboratory 11305 Glacier Highway Auke Bay, AK 99821

Kent Wohl US Fish & Wildlife Service 1011 E Tudor Road Anchorage, AK 99503 Bruce Wright OOSDAR, NOAA POB 210029 Auke Bay, AK 99821

Kate Wynne University of Alaska MAP 900 Trident Way Kodiak, AK 99615

Linda Yarborough US Forest Service 3301 C Street Anchorage, AK 99503