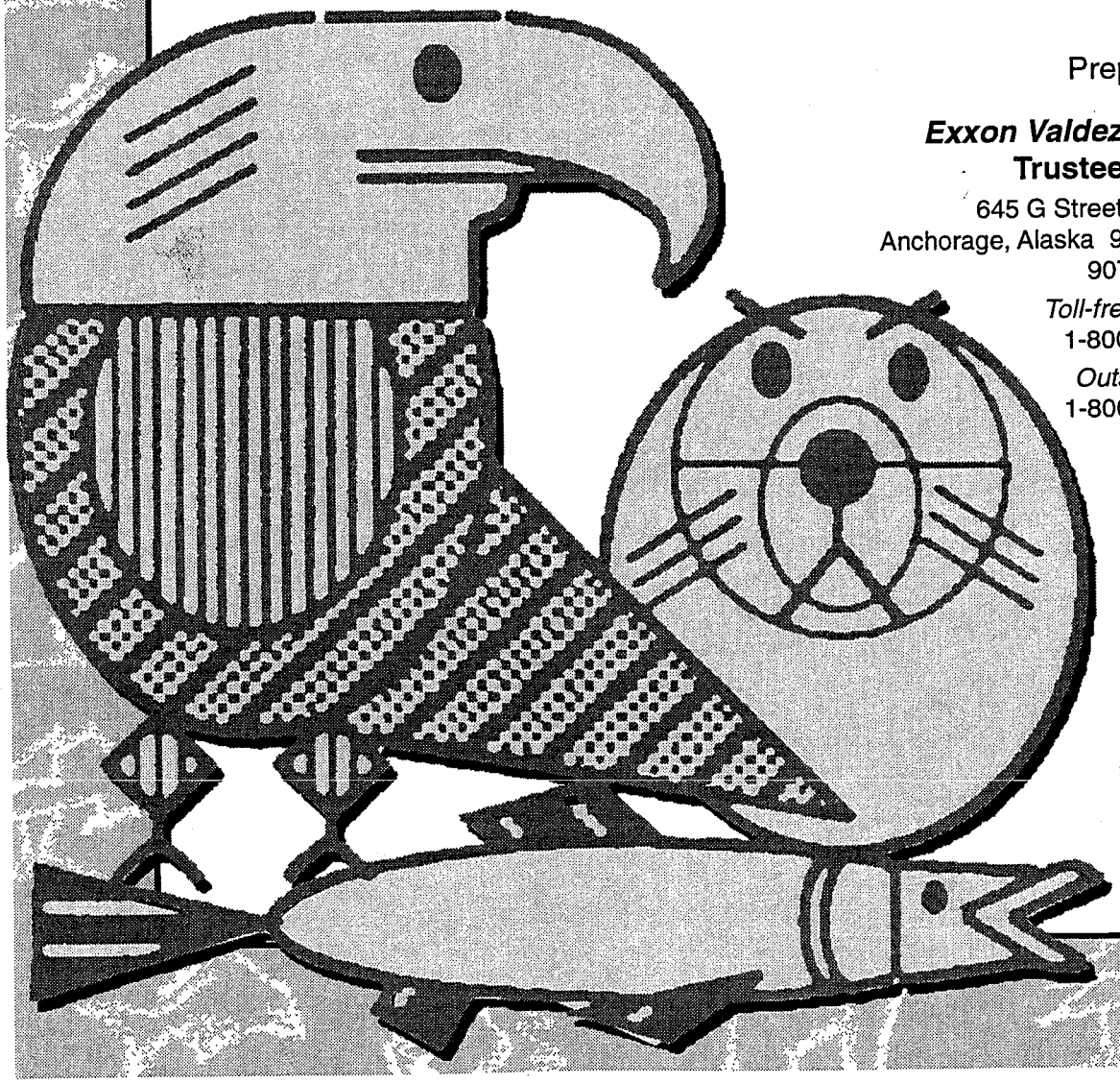
Invitation to Submit Restoration Projects for Federal Fiscal 1996

and

Draft Restoration Program: FY 96 and Beyond



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Invitation to Submit Restoration Projects for Federal Fiscal Year 1996 and Draft Restoration Program: FY 96 and Beyond

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INTRODUCTION

The *Exxon Valdez* Oil Spill Trustee Council funds activities to restore the resources and services injured by the 1989 *Exxon Valdez* oil spill. The Trustee Council is now seeking proposals for 1996, and public comment on the future use of restoration funds.

This document has two parts:

- Part 1 is an **Invitation** for individuals, private industry, governmental agencies, and other interested parties to submit proposals for federal fiscal year 1996 (FY 96), which is the period October 1, 1995 through September 30, 1996. Proposals are due by May 1, 1995.

- Part 2 presents, for public comment, a **Draft Restoration Program** for the period FY 96 through FY 98. Comments are due by May 1, 1995.

The Draft Restoration Program projects a long-range vision of research, monitoring, and general restoration needs. The Draft Restoration Program was developed, in large part, at the 1995 Restoration Workshop held January 17-20, 1995 in Anchorage. Over 120 participants, including individuals currently conducting restoration projects, scientists familiar with the spill, and members of the public reviewed previous years' work and analyzed restoration needs for the future. The Draft Restoration Program is a starting point for this year's funding decisions by the Trustee Council. It is being distributed to the public for review and comment. It has not been adopted by the Trustee Council.

Proposals submitted in response to the Invitation will be reviewed in the context of the Draft Restoration Program. However, the Trustee Council welcomes proposals not anticipated by the Draft Restoration Program.

Following scientific and technical review of proposals, those that are recommended for funding in FY 96 will be circulated for public review in the Draft FY 96 Work Plan, scheduled to be published in late June 1995.

Using public comment on the Draft FY 96 Work Plan and further scientific analysis, in late August 1995 the Trustee Council will approve projects for funding in FY 96. The Trustees' funding decisions will be based on their assessment of long-range restoration needs, and in many cases will reflect the Trustees' expectation to fund a project to its completion in a future fiscal year.

For the current year (FY 95), the Trustee Council approved approximately $23 million for restoration projects (excluding the Restoration Reserve, the Alaska SeaLife Center, and acquisition of habitat parcels). A lesser amount is expected to be available for FY 96.

Part 1
Invitation to Submit Restoration Proposals For Federal Fiscal Year 1996

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 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 1994, the Council adopted a *Restoration Plan* to guide the restoration effort. The plan is available by writing or calling the Trustee Council office. To be eligible for funding, proposals must be consistent with the policies in the *Restoration Plan,* and must be designed to achieve the recovery objectives for injured resources and services.

The *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;
- Habitat Acquisition and Protection; and
- Restoration Reserve.

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 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.

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. **Decisions about which parcels to purchase are *not* the subject of this invitation.** These decisions are being addressed through a separate process. For more information about the Habitat Acquisition and Protection program, see Part 2 (page 11).

Restoration Reserve provides a source of funding for restoration activities needed after the Exxon payments end. Exxon's last payment occurs in September 2001 and is expected to fund restoration for FY 2002 which begins October 1, 2001. Restoration activities needed for FY 2003 and beyond are expected to be funded from the Restoration Reserve. In November 1994, the Trustee Council made its second $12 million allocation to the Restoration Reserve. While annual allocations to the Reserve will be made after reviewing each year's restoration needs, the Council anticipates that, for each of the remaining seven years of Exxon payments, they will add $12 million to the Reserve. This would give the Reserve $108 million plus interest. Funds from the Restoration Reserve could potentially benefit any resource or service injured by the oil spill. All expenditures from the Restoration Reserve must be consistent with the requirements of the Civil Settlement.

Resources and Services Injured by the Spill

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

Only restoration proposals that are designed to restore the resources or services identified in Table 1 will be evaluated for FY 96 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 the activities will help subsistence or commercial fishing, or if it is a necessary part of a research proposal designed to help understand the injuries to a resource identified in the table.

Table 1. Resources and Services Injured by the Spill
The table includes only population-level and continuing sublethal injuries

INJURED RESOURCES			Lost or Reduced SERVICES
Biological Resources		Other	
Recovering Bald eagle Black oystercatcher Intertidal organisms (some) Killer whale Mussels Sockeye salmon (Red Lake) Subtidal organisms (some)	**Not Recovering** Common murre Harbor seal Harlequin duck Intertidal organisms (some) Marbled murrelet Pacific herring Pigeon guillemot Pink salmon Sea otter Sockeye salmon (Kenai & Akalura systems) Subtidal organisms (some)	Archaeological resources Designated wilderness areas Sediment	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			

The Chief Scientist and peer reviewers are currently evaluating recommendations to add the following resources to the table: Kittlitz's murrelets, black-legged kittiwakes, loons (common and yellow-billed), cormorants (double-crested, red-faced, and pelagic), arctic terns, scoters, and northwest crows. A decision concerning these recommendations will be made this spring.

Financial Summary

In the civil settlement, Exxon Corporation agreed to pay the United States and the State of Alaska $900 million over ten years to restore the resources and services injured by the spill. From these payments $337 million has been authorized as of March 1995 for research, monitoring, general restoration, habitat protection, reimbursements required by the civil settlement, and deductions. The Trustee Council has also allocated $24 million to the Restoration Reserve.

Past and estimated future uses of the civil settlement fund as of March 1995 are outlined in Table 2. Future costs in the table are estimates made for planning purposes. The Trustee Council members will base actual funding decisions on their examination of what is necessary for restoration at that time.

Table 2 shows that between $107 and $137 million are anticipated to be spent on work plan projects during the remaining seven years until Exxon payments end. The amount expected for work plan projects in FY 96 is expected to be less than the $23 million approved for FY 95.

Table 2. Past and Estimated Future Uses of Civil Settlement Funds as of March 1995
Figures in Millions of Dollars

Research, Monitoring & General Restoration ..... **Estimated at $217 – $247 million**

Past Authorizations: $110.5 million — Estimated Future Authorizations: $107 – $137 million

$19.2 million for the 1992 Work Plan
$15.5 million for the 1993 Work Plan
$27.8 million for the 1994 Work Plan
$23.0 million for the 1995 Work Plan
$25.0 million for Alaska Sealife Center

Estimated future work plan authorizations are calculated as the residual of $900 million less past and estimated future authorizations for other restoration purposes.

Restoration Reserve ..... **Estimated at $108 million plus interest**

Past Authorizations: $24.0 million — Estimated Future Authorizations: Anticipated at a total of $84 million ($12 million per year through fiscal year 2002)

Habitat Protection ..... **Estimated at $342 – $372 million**

Past Actions: $50.2 million — Estimated Future Actions: $292 – $322

$7.5 million for inholdings in Kachemak Bay State Park
$39.6 million for Seal Bay on Afognak Island ($38.7 for purchase and $0.9 in estimated interest)
$3.1 million for timber rights at Orca Narrows

Reimbursements ..... **Estimated at $177 million**

Past Reimbursements: $150.4 — Estimated Future Reimbursements: $26.3 million

For reimbursements to the federal and state governments for past damage assessment, cleanup, response, restoration, and litigation expenses.

Adjustments ..... **$26 million**

More precise estimate is $25.7 million, including $39.9 million deducted by Exxon from the 1992 payment for the costs of cleanup completed after January 1, 1991; plus $0.6 million in court fees; minus a credit of $8.1 million for interest earned; and minus a credit of $6.7 million not expended by agencies.

Total Expenditures **$900 million**

General Instructions for Submitting a Proposal

All proposals must be received by **May 1, 1995.** When submitting a proposal you must include:

- Three paper copies and one electronic copy of the Detailed Project Description. The format and instructions for completing DPDs are given in Appendix A.
- Three paper copies and one electronic copy of the Detailed Budget. The format and instructions for completing a Detailed Budget are given in Appendix B. To make it easier to fill out the forms, we will supply an Excel shell document for you to use. Please call the Trustee Council office to get a copy. If you do not have Excel, cannot generate an electronic copy, or need to make other arrangements, please call and make arrangements *before* May 1.
- All proposals should be sent to:

  Exxon Valdez Oil Spill Trustee Council
  645 G Street
  Anchorage, AK 99501
  Telephone 278-8012
  (Toll free within Alaska 800-478-7745; outside Alaska 800-283-7745)
- Electronic copies may be sent by E-mail, Attn: Bob Loeffler.
  The compuserve address is: 73160,1771
  The internet address is: 73160.1771@compuserve.com
  Electronic copies must be on an IBM compatible disk, in WordPerfect 5.1 or 6.0.
- No Faxes, please.

If you have a restoration idea that you would like the Trustee Council to consider but do not want to implement it yourself, send your idea to the Trustee Council. Provide as much of the information described in Appendix A as you can. If necessary, one of the Trustee Agencies may further develop the proposal to the point where it can be fully evaluated in terms of its scientific methodology and cost.

If you want to submit a proposal, and you work for a private organization or non-profit group, the Trustee Council welcomes your proposal. The Council encourages the active participation of individuals and groups outside state and federal agencies. However, requirements of state and federal law leave few options for funding a private firm to implement a proposal without further competitive solicitation. Funds are usually awarded to private parties through a Request for Proposals issued *after* the Council approves funding for a project. Thus, you may have to compete against other bidders for the funds to implement your proposal. However, to provide flexibility and additional options, the Trustee Council is using a limited, competitive solicitation for research and monitoring proposals to private parties as a part of this Invitation. For successful proposers, NOAA may begin contract negotiations directly with the proposer without a further competitive solicitation. The solicitation is described on the next page.

A Competitive Solicitation: Notice of Broad Agency Announcement. In FY 95, the Trustee Council tested two limited competitive methods for soliciting proposals from private parties as part of the Invitation. This year, the Council is expanding the scope of one of those methods, the Broad Agency Announcement (BAA). In conjunction with this Invitation, the National Oceanic and Atmospheric Administration (NOAA) is issuing a Broad Agency Announcement on behalf of the Trustee Council requesting proposals for any of the *research or monitoring* topics identified in this Invitation.

Research or monitoring proposals submitted to NOAA under the BAA will be evaluated at the same time as others submitted to the Trustee Council. A decision to approve or disapprove funding will be made at the end of August 1995. If funding is approved, NOAA may begin contract negotiations directly with the proposer without pursuing a further competitive solicitation. In some cases, however, a further competitive solicitation may be recommended. For projects submitted under the BAA, oversight of the project may be provided by NOAA or by another Trustee Agency in cooperation with NOAA.

State and federal agencies, including the University of Alaska, can be funded directly by the Trustee Council and should not submit a proposal under the BAA.

Private sector or non-profit groups wishing to submit a proposal under the BAA must submit their proposals to NOAA. In addition to the copies required by NOAA for the BAA, three copies of the Detailed Project Description, three copies of the Detailed Budget, and one electronic copy of each must also be submitted to the Trustee Council with the words "also submitted under the BAA" as part of the project title. See Appendices A and B for instructions concerning the Detailed Project Description, and Detailed Budget.

More information, including proposal requirements and evaluation criteria, is available in the Broad Agency Announcement. Interested parties should obtain copies of BAA #52ABNF500082 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 **May 1, 1995**.

Changes from FY 95

This FY 96 Invitation differs from the FY 95 Invitation in important ways.

***Detailed* Project Descriptions, not *Brief* Project Descriptions.** Last year, a Brief Project Description (a 3-5 page summary of the proposal) was solicited in the Invitation and a Detailed Project Description (which provided additional technical and scientific information) was required later for those proposals approved by the Trustee Council. This year, Detailed Project Descriptions are being requested in this Invitation (no Brief Project Descriptions will be required). This approach allow for more effective review of proposals and will eliminate one step in the "paper process" of proposal development.

Detailed Budgets along with the Detailed Project Description. This year, in response to suggestions from scientists and reviewers, Detailed Budgets must be submitted along with the Detailed Project Description — by May 1, 1995. In previous years, budgets were required a few months after brief project description, but before the detailed project description. These staggered dates prompted multiple reviews. Combining the reviews and due dates will decrease the work for proposers and streamline the review process.

Multi-year Funding for Multi-year Projects. This year, the Trustee Council's decision to fund a project will reflect the expectation that it will be funded to the project's completion. However, the Trustee Council will reassess funding needs each year based on a project's progress, information gained each year, and an assessment of restoration needs.

To make these long-term decisions, the Trustee Council will evaluate not just the FY 96 component of the project, but the full project to its completion. While the Detailed Project Description should focus on the work proposed in FY 96, it must also explain the project's overall objectives and endpoint — what the project will ultimately accomplish for restoration, and when — and must include estimated annual costs through completion.

The Trustee Council recognizes that estimates of future years' work are in fact estimates — the cost and methodology may need modification on the basis of each year's findings and a budget review. Some changes are expected. Nevertheless, an estimate of what will be accomplished, by when, and at what cost is necessary if the Trustees are to make long-term decisions.

No Interim Budgets. This year, the Trustee Council is expected to approve FY 96 funding before the federal fiscal year begins (October 1, 1995). Funds will be available at the start of the fiscal year and no interim budgets will be required. This schedule will save a step in the approval process, and decrease the amount of work required of proposers.

Evaluation of Proposals

All proposals received by the Trustee Council, including those received by NOAA under the Broad Agency Announcement, will be subject to independent scientific review. They will also be examined by the Trustee Council's Public Advisory Group, a 17-member advisory group representing a cross-section of interest groups affected by the spill. The Executive Director will use the recommendations of the independent scientific review, the Public Advisory Group, agency staff, and public comment received before May 1 to compile a draft plan that describes projects proposed for funding. That document, the Draft FY 1996 Work Plan, will be published in late June 1995.

The Draft FY 96 Work Plan will be subject to additional review and comment from the public, independent scientists, the Public Advisory Group, and staff. It is anticipated that the Trustee Council will decide upon the final FY 96 Work Plan at the end of August 1995. Unanimous agreement of all six state and federal Trustee Council members is required to fund a proposal.

Public Meeting for Questions about Submitting Proposals

A teleconferenced meeting is scheduled for Tuesday April 18, 1995 at 2:30 PM to allow those writing proposals to ask questions about the proposal instructions or evaluation process. If you are in Anchorage, come to the Restoration Office on 645 G Street at that time. If are not in Anchorage and would like to participate by teleconference, please call Rebecca Williams at 907-278-8012 (or 1-800-478-7745, toll free within Alaska; or 1-800-283-7745 toll free outside Alaska) by April 17th. **However, please call at any time if you have questions.**

A series of public meetings is also being scheduled to discuss the Trustee Council's restoration program for FY 96 and future years. These meetings will be held during April 1995 in communities throughout the spill area and will be advertised in local newspapers and in the Trustee Council newsletter. You may also obtain a list of the meeting dates from the Trustee Council office.

Part 2. Draft RESTORATION PROGRAM: FY 96 and Beyond

Summary

Each year, the Trustee Council sponsors a workshop involving project leaders, scientists familiar with the spill, and members of the public. Participants reviewed information gained since the spill, and opportunities and needs for restoration in the upcoming year. This year, over 120 people participated in the 1995 Restoration Workshop, held January 17-20, 1995 in Anchorage.

This Draft Restoration Program: FY 96 and Beyond is based, in large part, on that workshop. It represents a variety of views of restoration needs, focusing on FY 96 and extending to future years. It is a useful starting point for this year's funding decisions by the Trustee Council. It is being distributed to the public for review and comment. It has not been adopted by the Trustee Council.

This summary section explains highlights of the program that may not be apparent from reading only the individual parts.

ECOSYSTEM INVESTIGATIONS. In this view of long-range restoration needs, almost half of the funds forecast for FY 96 go toward three multi-year ecosystem studies of Prince William Sound. This proposed emphasis on ecosystem investigations is a significant change from earlier work plans funded by the Trustee Council. It reflects an understanding by the Trustee Council that restoration issues are complex, and research must often take a long-term approach to understand the physical and biological interactions and may be constraining recovery of injured resources and services. The results of these efforts could have important implications for restoration, for how fish and wildlife resources are managed, and for the communities and individuals who depend upon the injured resources.

In 1994, the Trustee Council initiated the Sound Ecosystem Assessment (SEA). Two additional ecosystem studies are proposed for FY 95: the Seabird/Forage Fish project, and the Nearshore Vertebrate Predators project. These two studies are currently undergoing scientific review, and are expected to come before the Trustee Council for approval in March 1995 for funding in FY 95. The Draft Restoration Program describes early versions of each proposal.

- The Sound Ecosystem Assessment investigates ecosystem processes that may be constraining recovery of herring and pink salmon.

- The Seabird/Forage Fish project examines the hypothesis that a shift in the Prince William Sound marine trophic structure has prevented recovery of seabirds and marine mammals.

- The Nearshore Vertebrate Predators project focuses on ecosystem relationships that may be constraining recovery of sea otters, river otters, harlequin ducks, and pigeon guillemots. The package is designed to determine whether or not populations are recovering, isolate processes constraining recovery, and identify potential activities to help recovery.

PROPOSALS NOT ANTICIPATED IN THE DRAFT SCIENCE PLAN. The Trustee Council expects that most proposals received in response to this Invitation have been anticipated in the pages that follow. However, the Trustee Council also welcomes and encourages proposals for new projects. It is quite likely that some FY 96 funding will go toward worthwhile proposals not currently anticipated.

A FINANCIALLY SUSTAINABLE RESTORATION PROGRAM. Complete recovery from the oil spill may not occur for decades. To fully understand the effect of the oil spill injuries on the ecosystem and to take appropriate restoration actions may require restoration activities well into the future. Funds are limited, and the Draft Restoration Program forecasts expenses into the future to allow the Trustee Council to understand the implication of this year's funding decisions on future years' decisions. This enables the Council to ensure that the restoration program is financially sustainable for the long-term needed to accomplish recovery. Last year, the Trustee Council funded $23 million worth of general restoration, research, and monitoring projects. To accomplish a financially sustainable, restoration program over the long term, the Trustee Council is expected to approve a lesser amount in FY 96.

INTEGRATION OF RESTORATION ACTIVITIES. An efficient restoration program requires well-coordinated restoration activities. Trustee Council staff will work to ensure that research and monitoring projects funded by the Council use methodologies and measurement techniques that work in concert to improve our understanding of the spill area ecosystem. By providing complementary data and methods, the sum of the restoration research will leave a legacy that is greater than the products of the individual projects.

EMPHASIS ON PEER REVIEWED LITERATURE — INFORMATION AVAILABLE TO THE PUBLIC. The Trustee Council has a responsibility to the public to report on and make available the results of all projects that it funds. Investigators conducting restoration projects are required to produce reports of their work on a regular and timely basis. Contents and timelines for reports will be determined jointly by staff and the investigator. With the approval of the Chief Scientist, reports may include agency reports, status reports, multi-year project reports, manuscripts to be submitted to a peer-reviewed journal, or a combination. To provide for the widest dissemination and usefulness of its products, the Trustee Council strongly encourages publication of scientific results in peer-reviewed journals. Please contact the Restoration Office regarding publication of results from Trustee Council funded projects. Reporting to the public and scientific community on project results is a responsibility that the Trustee Council takes very seriously. Investigators working under Trustee Council funding are expected to meet their responsibilities for timely reports.

ADMINISTRATION. The Draft Restoration Program continues the Trustee Council's policy to minimize administrative costs. The Executive Director estimates that administration costs will diminish from $4.2 million in FY 95, to $1.5 million in FY 2002.

FINANCIAL SUMMARY OF THE DRAFT RESTORATION PROGRAM. Table 3 shows the annual costs estimated by project leaders and workshop participants for FY 96 through FY 98. Costs are estimates for planning purposes and may change as proposals are reviewed and revised. Cost estimates are likely to decline in accuracy as they are projected further into the future.

Table 3 shows that the workshop participants forecast almost $19 million in proposals for FY 96. These costs do not include proposals currently in planning for which cost estimates are not available. These include Project 95093, PWSAC: Pink Salmon Restoration; and Lowe River and Port Dick Supplementation Projects, part of project 95139; and the Sound Waste Management Plan, project 95115. In addition, Trustee Council agencies are working with subsistence communities to develop projects to restore subsistence, and local groups may propose local heritage preservation projects for archaeologic resources. Finally, other new proposals may be submitted in response to this Invitation. New proposals will be evaluated along with those anticipated by this Draft Restoration Program.

Table 3. RESTORATION PROJECT COSTS: FY92 - 98

DRAFT

This table displays actual expenditures for FY 92 and FY 93, authorized amounts for FY 94 and FY 95, and estimates for future costs. FY 95 costs for Projects 163 (Seabird/Forage Fish) and 025 (Nearshore Vertebrate Predator) include recent funding requests that the Trustee Council has not yet approved. None of the costs projected for FY96-98 has been approved.

Project	FY92	FY93	FY94	FY95	**FY96**	**FY97**	**FY98**	Subtotal FY92-95	**Subtotal FY96-98**	Total FY92-98
Pink Salmon	$1,834.7	$847.6	$1,729.8	$2,543.5	**$1,648.6**	**$1,251.3**	**$944.7**	$6,955.6	**$3,844.6**	$10,800.2
076 / Effect of Oiled Incubation Substrate on Survival and Straying of Wild Pink Salmon (lab)	$0.0	$0.0	$0.0	$179.9	**$327.5**	**$424.3**	**$314.7**	$179.9	**$1,066.5**	$1,246.4
093 / PWSAC: Pink Salmon Restoration	$0.0	$0.0	$0.0	$100.0				$100.0		$100.0
139 / Salmon Instream Habitat Restoration	$0.0	$0.0	$344.8	$319.0	**$5.0**	**$5.0**	**$0.0**	$663.8	**$10.0**	$673.8
191 / Oil-Related Egg and Alevin Mortalities	$412.9	$699.0	$880.7	$806.1	**$847.1**	**$473.0**	**$281.0**	$2,798.7	**$1,601.1**	$4,399.8
320-B / Coded Wire Tag Recovery - PWS Pink Salmon	$1,421.8	$148.6	$279.2	$260.5	**$249.0**	**$249.0**	**$249.0**	$2,110.1	**$747.0**	$2,857.1
320-C / Otolith Mass Marking of PWS Pink Salmon	$0.0	$0.0	$53.9	$651.0	**$90.0**	**$100.0**	**$100.0**	$704.9	**$290.0**	$994.9
320-D / Pink Salmon Genetics	$0.0	$0.0	$171.2	$227.0	**$130.0**	**$0.0**	**$0.0**	$398.2	**$130.0**	$528.2

NOTES: 1) Costs projected for FY 96-98 are for planning purposes and have not yet been approved by the Trustee Council.
2) A blank space means costs are unspecified for that year.

Project	FY92	FY93	FY94	FY95	**FY96**	**FY97**	**FY98**	Subtotal FY92-95	**Subtotal FY96-98**	Total FY92-98
Herring	$0.0	$0.0	$1,114.0	$2,103.5	**$1,987.0**	**$1,100.0**	**$400.0**	$3,217.5	**$3,487.0**	$6,704.5
074 / Herring Reproductive Impairment	$0.0	$0.0	$0.0	$407.1	**$407.0**	**$0.0**	**$0.0**	$407.1	**$407.0**	$814.1
165 / Herring Genetic Stock Identification	$0.0	$0.0	$42.2	$105.4	**$97.0**	**$0.0**	**$0.0**	$147.6	**$97.0**	$244.6
165 / Herring Stock Identification in PWS	$0.0	$0.0	$42.2	$165.4	**$97.0**	**$0.0**	**$0.0**	$207.6	**$97.0**	$304.6
166 / Herring Natal Habitats	$0.0	$0.0	$466.3	$512.8	**$493.0**	**$350.0**	**$0.0**	$979.1	**$843.0**	$1,822.1
166 / Herring Natal Habitats	$0.0	$0.0	$466.3	$512.8	**$493.0**	**$350.0**	**$0.0**	$979.1	**$843.0**	$1,822.1
320-S / Herring Disease	$0.0	$0.0	$97.0	$400.0	**$400.0**	**$400.0**	**$400.0**	$497.0	**$1,200.0**	$1,697.0
Sound Ecosystem Assessment	$0.0	$0.0	$5,928.3	$4,612.8	**$4,600.0**	**$3,600.0**	**$2,600.0**	$10,541.1	**$10,800.0**	$21,341.1
320-A, E-N, P, Q, T, U, and Y / Sound Ecosystem Assessment	$0.0	$0.0	$5,928.3	$4,612.8	**$4,600.0**	**$3,600.0**	**$2,600.0**	$10,541.1	**$10,800.0**	$21,341.1
Sockeye Salmon	$998.3	$844.4	$1,847.3	$1,569.7	**$1,345.0**	**$465.0**	**$340.0**	$5,259.7	**$2,150.0**	$7,409.7
255 / Kenai River Sockeye Salmon Restoration	$687.4	$405.2	$406.1	$502.7	**$370.0**	**$190.0**	**$190.0**	$2,001.4	**$750.0**	$2,751.4
258 / Sockeye Salmon Overescapement	$0.0	$0.0	$854.9	$793.4	**$700.0**	**$0.0**	**$0.0**	$1,648.3	**$700.0**	$2,348.3
259 / Coghill Lake Sockeyes	$0.0	$145.1	$324.1	$273.6	**$275.0**	**$275.0**	**$150.0**	$742.8	**$700.0**	$1,442.8

NOTES: 1) Costs projected for FY 96-98 are for planning purposes and have not yet been approved by the Trustee Council.
2) A blank space means costs are unspecified for that year.

Project	FY92	FY93	FY94	FY95	FY96	FY97	FY98	Subtotal FY92-95	Subtotal FY96-98	Total FY92-98
504 / Genetic Stock ID of Kenai River Sockeye	$310.9	$294.1	$262.2	$0.0	$0.0	$0.0	$0.0	$867.2	$0.0	$867.2
Cutthroat and Dolly Varden	$37.9	$0.0	$0.0	$134.8	$8.0	$8.0	$8.0	$172.7	$24.0	$196.7
043-B / Cutthroat Trout Habitat Restoration	$0.0	$0.0	$0.0	$134.8	$8.0	$8.0	$8.0	$134.8	$24.0	$158.8
R106 / Dolly Varden Restoration	$37.9	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$37.9	$0.0	$37.9
Marine Mammals	$24.7	$334.4	$323.9	$913.2	$773.4	$773.4	$175.0	$1,596.2	$1,721.8	$3,318.0
001 / Condition and Health of Harbor Seals	$0.0	$0.0	$0.0	$172.8	$200.0	$200.0	$50.0	$172.8	$450.0	$622.8
012 / Comprehensive Killer Whale Investigation	$0.0	$113.5	$33.7	$298.7	$200.0	$200.0	$50.0	$445.9	$450.0	$895.9
020 / Marine Mammal Book Publication	$0.0	$0.0	$20.0	$0.0	$0.0	$0.0	$0.0	$20.0	$0.0	$20.0
064 / Monitoring, Habitat Use, and Trophic Interactions of Harbor Seals in PWS	$24.7	$220.9	$270.2	$347.1	$338.4	$338.4	$75.0	$862.9	$751.8	$1,614.7
117-BAA / Harbor Seals and EVOS: Blubber and Lipids as Indicaes of Food Limitations	$0.0	$0.0	$0.0	$94.6	$0.0	$0.0	$0.0	$94.6	$0.0	$94.6
Pilot Project: Community-Based Monitoring	$0.0	$0.0	$0.0	$0.0	$35.0	$35.0	$0.0	$0.0	$70.0	$70.0

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Project	FY92	FY93	FY94	FY95	**FY96**	**FY97**	**FY98**	Subtotal FY92-95	**Subtotal FY96-98**	Total FY92-98
Nearshore Ecosystem	$1,725.4	$1,600.5	$2,386.6	$3,102.5	**$2,766.9**	**$2,550.6**	**$2,487.9**	$8,815.0	**$7,805.4**	$16,620.4
025 / Nearshore Vertebrate Predator Package	$0.0	$0.0	$0.0	$726.2	**$1,644.6**	**$1,644.6**	**$1,644.6**	$726.2	**$4,933.8**	$5,660.0
026 / Hydrocarbon Monitoring	$0.0	$0.0	$0.0	$146.9	**$0.0**	**$0.0**	**$0.0**	$146.9	**$0.0**	$146.9
027 / Kodiak Shoreline Assessment	$0.0	$0.0	$0.0	$447.8	**$110.8**	**$0.0**	**$0.0**	$447.8	**$110.8**	$558.6
038 / PWS Shoreline Assessment	$0.0	$163.9	$0.0	$0.0	**$0.0**	**$0.0**	**$400.0**	$163.9	**$400.0**	$563.9
086-C / Herring Bay Experimental and Monitoring Studies	$0.0	$504.6	$729.4	$742.6		**$0.0**	**$0.0**	$1,976.6	**$0.0**	$1,976.6
090 / Mussel Bed Monitoring	$769.3	$318.6	$681.1	$438.8	**$216.4**	**$80.0**	**$216.4**	$2,207.8	**$512.8**	$2,720.6
106 / Eelgrass Monitoring	$0.0	$0.0	$0.0	$200.4	**$219.1**	**$0.0**	**$0.0**	$200.4	**$219.1**	$419.5
266 / Experimental Oil Removal	$0.0	$0.0	$398.1	$172.9	**$0.0**	**$0.0**	**$0.0**	$571.0	**$0.0**	$571.0
427 / Harlequin Monitoring (assumes winter surveys FY96-98 and spring survey FY98)	$470.5	$194.3	$139.3	$226.9	**$126.0**	**$126.0**	**$226.9**	$1,031.0	**$478.9**	$1,509.9
Black Oystercatcher Projects	$0.0	$109.1	$17.3	$0.0	**$0.0**	**$0.0**	**$0.0**	$126.4	**$0.0**	$126.4
Pigeon Guillemot Projects	$0.0	$165.9	$214.0	$0.0	**$0.0**	**$0.0**	**$0.0**	$379.9	**$0.0**	$379.9
R102 / Intertidal/Subtidal Monitoring (Coastal Habitat Restoration)	$485.6	$0.0	$0.0	$0.0	**$450.0**	**$700.0**	**$0.0**	$485.6	**$1,150.0**	$1,635.6
Sea Otter Projects	$0.0	$144.1	$207.4	$0.0	**$0.0**	**$0.0**	**$0.0**	$351.5	**$0.0**	$351.5

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Project	FY92	FY93	FY94	FY95	**FY96**	**FY97**	**FY98**	Subtotal FY92-95	**Subtotal FY96-98**	Total FY92-98
Seabird/Forage Fish & Related Projects	$743.4	$430.2	$1,294.7	$2,604.6	**$2,550.7**	**$2,350.0**	**$2,020.0**	$5,072.9	**$6,920.7**	$11,993.6
021 / Seasonal Movements by Common Murres	$0.0	$0.0	$0.0	$54.0	**$0.0**	**$0.0**	**$0.0**	$54.0	**$0.0**	$54.0
029 / Population Survey of Bald Eagles in PWS	$0.0	$0.0	$0.0	$48.7	**$0.0**	**$0.0**	**$0.0**	$48.7	**$0.0**	$48.7
031 / Reproductive Success of Murrelets in PWS	$0.0	$0.0	$0.0	$250.0	**$250.0**	**$250.0**	**$0.0**	$250.0	**$500.0**	$750.0
039-A/ Common Murre Population Monitoring	$314.9	$174.6	$227.1	$0.0	**$100.0**	**$100.0**	**$20.0**	$716.6	**$220.0**	$936.6
039-B / Common Murre Productivity Monitoring	$0.0	$0.0	$0.0	$30.5	**$42.0**	**$0.0**	**$0.0**	$30.5	**$42.0**	$72.5
041 / Introduced Predator Removal	$0.0	$0.0	$84.0	$66.5	**$0.0**	**$0.0**	**$0.0**	$150.5	**$0.0**	$150.5
058 / Symposium on Seabird Restoration	$0.0	$0.0	$0.0	$74.4	**$0.0**	**$0.0**	**$0.0**	$74.4	**$0.0**	$74.4
102 / Murrelet Prey and Foraging Habitat	$428.5	$0.0	$231.5	$63.8	**$0.0**	**$0.0**	**$0.0**	$723.8	**$0.0**	$723.8
121 / Fatty Acid Signatures of Forage Fish	$0.0	$0.0	$0.0	$30.0	**$0.0**	**$0.0**	**$0.0**	$30.0	**$0.0**	$30.0
159 / Marine Bird and Sea Otter Boat Surveys	$0.0	$255.6	$145.5	$0.0	**$260.0**	**$0.0**	**$0.0**	$401.1	**$260.0**	$661.1
163 / Seabird/Forage Fish	$0.0	$0.0	$606.6	$1,986.7	**$1,898.7**	**$2,000.0**	**$2,000.0**	$2,593.3	**$5,898.7**	$8,492.0

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Project	FY92	FY93	FY94	FY95	**FY96**	**FY97**	**FY98**	Subtotal FY92-95	**Subtotal FY96-98**	Total FY92-98
Subsistence	$0.0	$241.7	$590.3	$1,006.9	**$329.0**	**$209.1**	**$214.8**	$1,838.9	**$752.9**	$2,591.8
009-D / Octopus/Chiton Survey	$0.0	$0.0	$0.0	$125.0	**$103.0**	**$0.0**	**$0.0**	$125.0	**$103.0**	$228.0
052 / Community Participation/Communication	$0.0	$0.0	$0.0	$152.0	**$152.0**	**$152.0**	**$152.0**	$152.0	**$456.0**	$608.0
127 / Tatitlek Salmon Release	$0.0	$0.0	$0.0	$5.0				$5.0		$5.0
131 / Clam Restoration (continue if pilot project succeeds)	$0.0	$0.0	$0.0	$226.9				$226.9		$226.9
138 / Elders/Youth Conference	$0.0	$0.0	$0.0	$76.4	**$0.0**	**$0.0**	**$0.0**	$76.4	**$0.0**	$76.4
244 / Harbor Seal/Sea Otter Cooperative Effort	$0.0	$0.0	$54.5	$93.9	**$22.1**	**$0.0**	**$0.0**	$148.4	**$22.1**	$170.5
272 / Chenega Chinook Release	$0.0	$10.7	$57.4	$47.2	**$51.9**	**$57.1**	**$62.8**	$115.3	**$171.8**	$287.1
279 / Food Safety Testing	$0.0	$231.0	$379.2	$180.6	**$0.0**	**$0.0**	**$0.0**	$790.8	**$0.0**	$790.8
428 / Community Planning Project	$0.0	$0.0	$99.2	$99.9	**$0.0**	**$0.0**	**$0.0**	$199.1	**$0.0**	$199.1
Archaeological Resources	$123.3	$1,551.9	$587.0	$457.7	**$130.0**	**$80.0**	**$80.0**	$2,719.9	**$290.0**	$3,009.9
007-A / Archaeological Site Monitoring	$0.0	$81.9	$587.0	$341.7	**$80.0**	**$80.0**	**$80.0**	$1,010.6	**$240.0**	$1,250.6
007-B / Completion of Artifact Curation - SEW-440/488	$0.0	$0.0	$0.0	$116.0	**$50.0**	**$0.0**	**$0.0**	$116.0	**$50.0**	$166.0
066 / Alutiiq Archaeological Repository	$0.0	$1,470.0	$0.0	$0.0	**$0.0**	**$0.0**	**$0.0**	$1,470.0	**$0.0**	$1,470.0

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Project	FY92	FY93	FY94	FY95	FY96	FY97	FY98	Subtotal FY92-95	Subtotal FY96-98	Total FY92-98
R104-A / Site Stewardship	$123.3	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$123.3	$0.0	$123.3
Recreation	$0.0	$40.8	$76.3	$0.0	$0.0	$0.0	$0.0	$117.1	$0.0	$117.1
065 / Prince William Sound Recreation Project	$0.0	$40.8	$76.3	$0.0	$0.0	$0.0	$0.0	$117.1	$0.0	$117.1
Reduction of Marine Pollution	$0.0	$0.0	$0.0	$516.7	$20.0	$0.0	$0.0	$516.7	$20.0	$536.7
115 / Sound Waste Management Plan	$0.0	$0.0	$0.0	$284.5	$20.0			$284.5	$20.0	$304.5
417 / Waste Oil Disposal Facilities	$0.0	$0.0	$0.0	$232.2	$0.0	$0.0	$0.0	$232.2	$0.0	$232.2
Habitat Protection and Acquisition	$0.0	$156.8	$2,912.4	$1,398.4	$500.0	$0.0	$0.0	$4,467.6	$500.0	$4,967.6
058 / Landowner Assistance Program	$0.0	$0.0	$0.0	$115.8	$0.0	$0.0	$0.0	$115.8	$0.0	$115.8
059 / Habitat Identification Workshop	$0.0	$23.1	$0.0	$0.0	$0.0	$0.0	$0.0	$23.1	$0.0	$23.1
060 / Accelerated Data Acquisition	$0.0	$43.9	$0.0	$0.0	$0.0	$0.0	$0.0	$43.9	$0.0	$43.9
060 / Spruce Bark Beetle Impacts	$0.0	$0.0	$0.0	$26.8	$0.0	$0.0	$0.0	$26.8	$0.0	$26.8
064 / Imminent Threat Habitat Protection	$0.0	$89.8	$0.0	$0.0	$0.0	$0.0	$0.0	$89.8	$0.0	$89.8
110 / Habitat Protection: Data Acquisition and Support	$0.0	$0.0	$580.7	$144.0	$0.0	$0.0	$0.0	$724.7	$0.0	$724.7

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Project	FY92	FY93	FY94	FY95	**FY96**	**FY97**	**FY98**	Subtotal FY92-95	**Subtotal FY96-98**	Total FY92-98
126 / Habitat Protection and Acquisition Support	$0.0	$0.0	$2,331.7	$1,111.8	**$500.0**	**$0.0**	**$0.0**	$3,443.5	**$500.0**	$3,943.5
Administration / Public Information	$5,068.6	$4,135.8	$5,662.6	$4,208.9	**$3,200.0**	**$3,200.0**	**$2,800.0**	$19,075.9	**$9,200.0**	$28,275.9
100 and 089 / Administration, Science Management, and Public Information (including Information Management System)	$5,068.6	$4,135.8	$5,250.0	$4,188.9	**$3,200.0**	**$3,200.0**	**$2,800.0**	$18,643.3	**$9,200.0**	$27,843.3
422 / Restoration Plan EIS	$0.0	$0.0	$343.6	$20.0	**$0.0**	**$0.0**	**$0.0**	$363.6	**$0.0**	$363.6
507 / Symposium Proceedings Publication	$0.0	$0.0	$69.0	$0.0	**$0.0**	**$0.0**	**$0.0**	$69.0	**$0.0**	$69.0
Total Cost :	$10,556.3	$10,184.1	$24,453.2	$25,173.2	**$19,858.6**	**$15,587.4**	**$12,070.4**	$70,366.8	**$47,516.4**	**$117,883.2**

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Pink Salmon

Summary

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 mortality in oiled areas match prespill levels or levels in unoiled areas.

COMPONENTS OF THE PINK SALMON RESTORATION PROGRAM. The Trustee Council's program to restore pink salmon has four parts:

- ***The Sound Ecosystem Assessment (SEA):*** a multi-year ecological investigation of the factors controlling populations of Prince William Sound pink salmon and herring. It is described separately beginning on page 43.
- ***Toxic Effect of Oil on Pink Salmon:*** research and monitoring to document and understand the apparent toxic effect that the 1989 oiling continues to have on pink salmon egg and alevin mortality.
  - Toxic Effect on Reproduction;
  - Toxic Effect on Growth; and
  - Laboratory Investigation of Straying and Marine Survival.
- ***Stock Separation and Management:*** providing better information for use by fishery managers to protect injured pink salmon runs that might otherwise be overharvested.
  - Marking Salmon — Coded Wire Tag and Otolith Thermal Marking;
  - Genetics and Stock Structure Investigations; and
  - Improving Escapement Goals.
- ***Supplementation:*** using artificial means to protect and restore wild pink salmon populations.
  - Current Salmon Supplementation Efforts;
  - Supplementation Projects Being Evaluated in 1995; and
  - Alternative Hatchery Release Sites.

COST ESTIMATES AND TIMELINES

	Approved Restoration Projects, FY 92 - 95:		$6,873,000
FY 96 - 99	Toxic Effect of Oil	$2,959,800	
FY 96 - 98	Stock Separation and Management	$1,167,000	
FY 96 - 97	Supplementation	$10,000	
	Subtotal of Proposed Future Work:		$4,136,800
	Total:		$11,009,800

Totals do not include projects currently being planned or evaluated: hatchery remote release investigations (95093), Lowe River Supplementation, and Port Dick Supplementation projects.

Summary: Toxic Effect of Oil on Pink Salmon

RECOVERY OBJECTIVE. Projects in this section contribute to the recovery of pink salmon through:

- the use of field and laboratory studies to determine the cause of the egg mortality and other direct oiling effects experienced by wild pink salmon; and
- monitoring the egg and alevin mortality to determine annual mortality and when recovery has occurred.

FINDINGS AND ACCOMPLISHMENTS. Investigations of injury to pink salmon indicate that:

- Eggs and larvae in oiled streams have lower survival than those in unoiled streams. This difference has persisted despite a vast reduction in the concentrations of hydrocarbons in the oiled streams, and is apparently the result of a genetic difference between fish returning to oiled and unoiled streams. The magnitude of the difference decreased from 1989 to 1994.
- Juvenile pink salmon were contaminated by exposure to oil in the marine environment in 1989, causing reduced growth. As a result, fewer adult pink salmon returned from the 1988 brood year. Contamination and reduced growth of juvenile pink salmon in the marine environment did not persist after 1989.

FY 96 AND BEYOND

- Continue annual monitoring of egg and alevin mortality (field studies) until the difference between mortality in oiled and unoiled streams is not statistically detectable for two years for each of the odd- and even-year pink salmon runs in Prince William Sound. The earliest this could occur is fall of 1997 (FY 98).
- Finish laboratory investigations to verify whether the mortality is due to inherited genetic differences caused by the original exposure to oil (closeout in FY 99).
- Investigate whether the 1989 oiling increased the rate of straying or decreased the rate of survival by continuing the 1995 lab study of pink salmon returns through two generations and brood years (closeout in FY 99).

COST ESTIMATES AND TIMELINES

	Approved Restoration Projects, FY 92 - 95:		$2,942,800
FY 96 - 98	Oil Related Egg and Alevin Mortalities (field)	$800,000	
FY 96 - 99	Oil Related Egg and Alevin Mortalities (lab)	$848,100	
FY 96 - 99	Pink Salmon Straying and Marine Survival (lab)	$1,311,700	
	Subtotal of Proposed Future Work:		$2,959,800
	Total:		$5,902,600

Discussion

Injuries to populations of wild pink salmon are difficult to detect because of the natural variation in their run strength. In the years preceding the spill, the total return varied widely from year to year, from a maximum return of 21.0 million fish in 1984 to a minimum of 1.8 million fish in 1988. Because of this variation, it is difficult for scientists to attribute the poor returns in 1992 and 1993 to injuries resulting from the oil spill.

Because of the difficulty in interpreting the variability in the abundance of wild pink salmon populations, understanding the injury to pre-adult life stages is the best method of understanding and documenting the injury to the adult returns. Previous research has suggested that larval populations and growth are key factors in determining the strength of the adult returns. Fewer and smaller juvenile salmon mean a smaller adult return. Reduced growth of juvenile salmon in 1989 probably resulted in reduced production of both wild and hatchery adults from the 1988 brood. Without the egg and alevin mortality, the returns of wild fish in 1992 and 1993 might have been better than they were, and the returns in other years might have been even more productive.

Projects in this group address the toxic effect of oil on pink salmon reproduction, growth, and straying.

TOXIC EFFECT ON REPRODUCTION. The toxic effect of oil on reproduction of pink salmon is being investigated through two studies in 1995 and previous years: 95191A (field study) and B (lab study).

Up to 75 percent of pink salmon spawning in PWS occurs in intertidal areas. In the spring of 1989, *Exxon Valdez* oil was deposited in varying thicknesses in intertidal portions of many western PWS streams. Pink salmon eggs deposited in 1988 (1988 brood year) emerged as fry through the oiled gravel during the spring of 1989 and began feeding on oiled plankton. Other studies indicate that oil-exposed fish grew slower and probably had reduced survival. Although gross oil levels decreased during the summer of 1989, contamination in the intertidal zone was still evident by fall.

The pink salmon eggs deposited during the late summer of 1989 (the 1989 brood year) were exposed to oil contamination in the gravel from late August 1989 through mid-May 1990 when the fry emerged. In the 1989 brood year, scientists detected elevated pink salmon egg mortality in the intertidal zones of oiled streams. Above high tide, where little oil was deposited, they detected no difference in egg mortality between oiled and non-oiled streams. In the 1990 brood year, scientists again found elevated egg mortality in the oiled streams but only in the highest intertidal spawning zone, where the majority of the shoreline oil was deposited.

Surprisingly, even though the concentration and toxicity of intertidal oil decreased significantly between 1989 and 1991, the scientists again found increased egg mortality for the 1991 brood year in the oiled streams during the 1991 fall survey. Furthermore, the

significant difference in egg mortality occurred at all tidal zones, including the area *above* mean high tide. Clearly, the elevated egg mortality in 1991 in the oiled streams was not the direct effect of 1991 exposure to oil. The 1991 adult returns were the progeny of the 1989 brood year, the group with the highest exposure to oil-contaminated spawning gravel (the 1989-90 incubation period). Scientists hypothesize that the elevated egg mortality in 1991 and subsequent years may be the result of genetic damage acquired during incubation in 1989. Elevated egg mortality was also found in 1992 and 1993. In 1994, the scientists found that egg mortality was not significantly different between the oil and unoiled streams.

Continued Monitoring. Scientists recommend that the monitoring be continued until egg mortality is not significantly different between oiled and unoiled streams for two years for each of the odd-year and even-year runs. The first year of the not-significantly-different results occurred for the even-year run in 1994. If this trend continues, 1997 will be the last year of monitoring. However, egg mortality is measured in the fall of the year. Thus, the 1997 egg measurements will occur at the start of FY 98. The monitoring is completed as a part of project 191B.

The continued egg mortality and the hypothesis of genetic damage have motivated a number of different efforts to better define and understand the injury to pink salmon. Efforts to restore damaged pink salmon populations depend upon the fishery managers' abilities to identify and monitor the causes of reduced survival and to monitor their persistence. Information on the potential of long-term oil exposure to cause genetic damage is useful for appropriate management of the injured stocks. In addition, verification of the genetic hypothesis would provide the first evidence that reproductive capacity of fish exposed to chronic or acute sources of oil pollution is compromised.

Eliminating Stream Conditions as a Cause of the Mortality. Previous studies have also been designed to eliminate the possibility that the elevated egg mortality is due to environmental differences among the streams. For example, the oiled streams were typically north facing. For that reason, ADF&G took gametes (eggs and sperm) from oiled and non-oiled streams, and incubated them under identical conditions at PWSAC's AFK hatchery near Chenega.

This experiment was first approved for 1992, after the surprising find of persistently high egg mortality in 1991. However, ADF&G scientists cancelled the experiment for that year because the 1992 escapement was very small and they did not want to risk reducing survival of the wild stocks by taking eggs from the streams. In August 1993, gametes were taken from eight oiled, and eight unoiled streams. The embryos were incubated at the AFK hatchery and examined in October. Scientists found elevated mortality in the eggs taken from the oiled streams. These findings were duplicated in a similar experiment in 1994. A final experiment is approved for 1995 which is expected to be the last year for this approach. (Closeout funding expected for FY 96).

These findings indicate that it is unlikely that elevated egg mortality in oiled streams is the result of differences in stream conditions, or continued exposure to oiled gravel.

Laboratory Verification of Inherited Damage. A second experimental approach is designed to provide laboratory verification that the pink salmon egg mortality observed in the field is due to oil exposure, and not to stream conditions that existed before the spill.

The study, conducted by NOAA, uses controlled laboratory oil exposures of fertilized eggs in a simulated intertidal gravel environment designed to mimic environmental exposures of 1989 and 1990. NOAA scientists take eggs from an unoiled stream at Little Port Walter (on Baranof Island in southeast Alaska), expose some to oil, and rear the exposed and unexposed eggs under identical conditions to determine whether the oil induces elevated egg mortality. This experiment used eggs from outside Prince William Sound to avoid any environmental variables in the Sound that may be causing the mortality. Scientists were concerned that the control group of eggs not include brood spawned in oiled gravel or the brood contaminated from stray pink salmon that spawned in oiled gravel.

NOAA's first egg take was in spring of 1992. In the fall of 1992, the scientists found a dosage-related relationship between egg mortality and exposure to oil — the greater the exposure, the greater the mortality. The pink salmon were pen-reared through 1994, but too many died (from a bacterial infection unrelated to oil) to conduct a meaningful investigation of their eggs. A similar dosage-related response was found in the 1993 brood. In addition, half of that year's juveniles were coded-wire tagged and released, and half are being pen-reared in Little Port Walter until maturity. The egg mortality of their progeny will be examined this year (1995).

NOAA's 1992 and 1993 results clearly show that oil in the incubation gravel causes egg and alevin mortality. If dosage-related mortality is found in the spawn of the 1995 fish, at concentrations similar to those that occurred in the field, this will clearly indicate that the elevated mortality is the result of the initial exposure.

If dosage-related damage is observed in the spawn of the 1995 fish, it will be necessary to examine the reproductive viability of these second generation fish to determine if the damage is actually heritable — passed on to the second generation of fish. This will require tagging fry in 1996 that are the progeny of fish exposed as embryos in 1993, and recovering and spawning the returning adults in 1997. This extension of the dosage experiment will only be undertaken if there is dosage-related damage in eggs or alevin viability of the 1995 fish, and if sufficient numbers of spawners from the different treatment groups are available.

Search for Genetic Damage. ADF&G Scientists have also begun to analyze DNA content of whole embryos and tissues for genetic damage using samples from oiled streams and from the laboratory experiments being conducted by NOAA. The work began in 1992 using flow cytometry techniques. That work continued in 1993 and a final report was written in 1994. The technique did not find conclusive evidence of genetic changes. Scientists are now in transition to begin using another technique to search for genetic damage, a DNA-sequencing based analysis. The sample analysis will be completed in 1996 and a final report from that technique is expected in FY 1997.

TOXIC EFFECT ON GROWTH. Juvenile pink salmon emigrating from their natal streams or released from hatcheries in the spring of 1989 encountered an environment that had been grossly polluted by oil. Pink salmon in oiled areas of Prince William Sound were contaminated by the oil, most likely through ingestion of particulate oil or contaminated prey, or direct exposure to oil on the surface of the water. In 1989, scientists also found that juvenile salmon growth was reduced in oiled locations of the Sound. Because growth of juvenile salmon is directly related to survival of the fish, this reduced growth resulted in fewer wild and hatchery fish in the 1990 return. Toxic effects of the spill on juvenile salmon in the marine environment were apparently limited to the year of the spill; there was no evidence of contamination or reduced growth of pink salmon juveniles due to oil after 1989.

LABORATORY INVESTIGATION OF PINK SALMON STRAYING AND MARINE SURVIVAL. The degree of straying of wild pink salmon is a key issue for the management and restoration of wild pink salmon stocks. Straying is the term used for the return of adult pink salmon to streams other than where they were spawned. Little is known about the straying rate of wild pink salmon. Unexpectedly high straying rates were observed in the Sound after the oil spill (NRDA Study F/S 3) for fish from both oiled and non-oiled streams. However, the results were confounded because fish from non-oiled streams may have been exposed to oil as they migrated along oiled beaches, and the tagging process itself may have contributed to the observed straying rates. If high straying rates occur without any influence from oil, then the genetic structure of the populations in Prince William Sound should be relatively homogeneous, and large-scale mixing of wild stocks and the hatchery stocks derived from them should be of lesser concern. Restoration of injured pink salmon runs could therefore be expected to occur naturally through recolonization from healthy stream systems. If straying rates are low but the presence of oil increases straying, then genetic damage hypothesized to occur as a result of incubation in oiled substrate may be passed on to pink salmon in streams not oiled by the *Exxon Valdez.*

The laboratory straying investigation began in 1995 (project 95076). Eggs of the 1995 brood year will be taken from a stream near Little Port Walter on Baranof Island in southeast Alaska. This will allow scientists to examine the response of pink salmon to oil exposure at a location remote from Prince William Sound, away from the confounding effect of prior oil exposure. A control group will be separated, and the remainder dosed with varying concentrations of oil. A similar egg take is planned for the 1996 brood. It will also examine other influences on straying. In the spring of 1996 and of 1997, 330,000 pink salmon fry will be tagged and released. Their return in 1997 and 1998 will be monitored in their natal stream in Little Port Walter and in nearby streams (within 50 kilometers of the natal stream). The results will help determine the influence of oil concentrations on the rate of straying and marine survival. The project will be complete in 1998 after two runs are monitored, and only closeout funding is expected for FY 99.

Summary: Stock Separation & Management for Pink Salmon

RECOVERY OBJECTIVE. Projects in this section contribute to the recovery of pink salmon by providing information to allow fisheries managers to adjust harvest location and timing to protect injured stocks of wild pink salmon.

FINDINGS AND ACCOMPLISHMENTS

- Coded-wire tagging of Prince William Sound pink salmon allowed managers to protect injured pink salmon runs that might have otherwise been inadvertently overharvested, especially in the southwest district of Prince William Sound in 1994.
- Studies of 1989 and 1990 Prince William Sound pink salmon returns provided detailed information useful for revising escapement goals, and better tools for managers to measure whether escapement is being met.

FY 96 AND BEYOND

- Continue in-season stock identification of Prince William Sound pink salmon;
- Develop otolith marking to replace coded wire tagging as the in-season management tool, and transfer the responsibility for funding to ADF&G and other groups by FY 98.
- Develop estimates of wild and hatchery straying.

COST ESTIMATES AND TIMELINES

	Approved Restoration Projects, FY 92-95:	$2,731,800
FY 96-98	Transition to Otolith Marking; transfer responsibility or funding to ADF&G & private groups	$1,037,000
	Total:	$3,768,800

Discussion

Adult returns from injured wild populations and from hatchery populations of pink salmon are heavily exploited by commercial fisheries. Successful restoration of injured populations requires that they be harvested at a lower rate until reproductive rates and populations return to historic average levels. Minimizing the catch of injured wild populations ensures that enough adults enter wild streams to spawn. The projects in this group provide ADF&G fisheries managers with estimates of the numbers of wild and hatchery fish in commercial harvests. The estimates are available during the fishing season, and enable managers to identify areas or times where harvest of injured wild populations can be minimized while permitting the timely harvest of economically important hatchery and healthy wild returns.

The Trustee Council recognizes that increasing management abilities is one of the best techniques to restore injured, harvested resources such as sockeye and pink salmon. While the Trustee Council recognizes the opportunities that increased management abilities holds for effective restoration, it also recognizes that its responsibility to fund these techniques is not permanent. If the techniques are effective, it is the responsibility of the managing agency or other groups to permanently take over funding and implementation. In this way,

the Trustee Council provides interim protection during the most critical part of recovery, and has permanently increased the ability of the manager to protect stocks injured by the oil.

MARKING PINK SALMON: CODED WIRE TAGGING AND OTOLITH THERMAL MARKING. There are approximately 900 pink salmon spawning streams in Prince William Sound. In 1989, oil was deposited in the spawning beds of 31 percent of the streams, and growth of the juvenile salmon was reduced. In the years after 1989, eggs from pink salmon originating from the oiled streams suffered higher egg mortality than fish from unoiled streams.

The problem of focusing harvest on uninjured runs in Prince William Sound is particularly challenging, because the state's largest hatchery program is located in the Sound. Four hatcheries produce pink salmon for the Sound's fisheries. The hatchery program tries to design hatchery returns to be temporally and spatially separate from natural stocks to allow commercial fisheries to target hatchery runs while leaving a large enough escapement of wild pink salmon to maintain the health of the wild stocks. The injury to some stocks of wild pink salmon exacerbated an already difficult management situation in the Sound.

Coded Wire Tagging. Coded wire tagging involves placing a thin wire, marked with a code, in salmon fry, and clipping the adipose fin before outmigration. It is typically done during hatchery rearing, but can also (more expensively) be done for wild stocks. When the fish return, personnel sampling the commercial harvest recognize the tagged fish by the clipped adipose fin, and recovering the coded wire tag. In that way, fisheries managers learn the origin of the returning fish.

Feasibility studies conducted before the spill, 1986-1988, established the utility of coded wire tagging for Prince William Sound. After the spill a large-scale coded wire tagging program was instituted to help estimate the spill's damage to pink salmon, and to aid fisheries managers. The program also produced significant information concerning pink salmon straying (the tendency of pink salmon to return to other than their natal stream).

While the information was important to fisheries managers in 1992 and 1993, the return of pink salmon in those years was so low to all locations — injured and uninjured wild stocks, and hatchery returns — that fishery managers were forced to severely limit all commercial fishing. In 1994, stock separation information from the coded wire tag program is credited with giving ADF&G fishery managers the ability to manage the fishery to allow adequate wild escapement, especially in the southwest district of Prince William Sound, without severely curtailing the fishery. This is an important achievement both in protecting the injured stocks of the hard-hit southwest district, and in maintaining commercial fishing services. (Most of the oil that went ashore in Prince William Sound did so in the southwest district, and that area contains most of the Sound's oiled streams.)

Otolith Thermal Mass Marking. Fisheries managers and other groups recommend changing the marking technique from coded wire tag to otolith marking. Otolith marks can be thermally applied to hatchery fish during incubation. (It can also be chemically applied to wild stocks.)

While the transition entails significant cost, otolith marking has important advantages over coded wire tags. The main advantage is that otolith techniques mark *all* hatchery fish, not just a sample. It is more accurate and less expensive in the long run. In addition, there is some concern that placing the coded wire tag in the olfactory organ of the fish diminishes its ability to imprint and may induce straying. Finally, otolith marking does not expose the fry to human handling (with the associated stress that handling may produce).

The otolith marking program will allow fisheries managers to determine straying rates for hatchery stocks. Because the technique marks all hatchery fish, it provides scientists a large enough sample size to estimate hatchery straying. Complementary techniques to mark the otolith of wild stocks may provide estimates of natural straying. (Another portion of the Trustee Council's proposed program investigates the effect of oil and tagging on straying rates — see Toxic Effect of Oil on Pink Salmon, Laboratory Investigation of Pink Salmon Straying and Marine Survival, page 28).

From 1989 through 1991, the Trustee Council funded tagging and tag recovery in Project F/S 3. In FY 92, the program was funded in project R 60 AB. In FY 93, the Prince William Sound Aquaculture Corporation (PWSAC), Valdez Fisheries Development Association (VFDA), and ADF&G pooled resources to fund tagging and half the cost of recovery. The Trustee Council funded the other half of recovery costs through project 93067. This funding arrangement continued through FY 95, in projects 94320B and 95320B.

Transition from Trustee Council Funding. The transition from Trustee Council funding to a permanent funding source marks the establishment of a permanent in-season management tool for Prince William Sound pink salmon. The transition schedule approved by the Trustee Council as part of the FY 95 Work Plan is outlined below. It shows the last year of Trustee Council funding to be in FY 98 at a cost of $249,000.

The schedule includes only one year of overlap between the coded wire tag program and the otolith marking program. In this schedule, the FY 95 funding is used to purchase and install equipment to begin otolith marking, but the program does not actually begin marking until FY 96 (i.e., the 1995 brood year are marked and released in 1996, and return in 1997 at which time the marks are read). The coded wire tag costs shown in the schedule are for recovery only. The tags are installed by ADF&G, PWSAC and VFDA. The schedule shows that the last year to recover tags is 1997.

Participants, including peer reviewers, at the 1995 Restoration Workshop unanimously recommended that *two* years of overlap be built into the transition. With only one year of overlap, there is no buffer if otolith marking does not meet expectations. That is, if there is a problem in 1997 when reading the otolith marks, managers will not have time to install coded wire tags in the outmigrating salmon. Because of the importance of the marking information in protecting wild stocks, especially in the southwest district of Prince William Sound, and because of its importance to other Trustee Council-funded research, the participants recommended that the transition should include two years of overlap. If so, the Trustee Council cost in FY 98 would increase from $249,000 to $349,000 to fund tag

recovery in FY 98. The Trustee Council will review the workshop recommendation during its deliberations on this year's work plan.

Draft Transition Funding Schedule
Coded Wire Tag and Otolith Marking
(figures in thousand dollars)

	FY94	FY95	FY96	FY97	FY98	FY99
CODED WIRE TAGS						
ADFG	$ 82	$ 70	$ 96	$ 86	$0	$0
PWSAC/VFDA	276	276	276	126	0	0
Trustee Council	**249**	**249**	**249**	**249**	**0**	**0**
Subtotal:	$607	$595	$621	$461	$0	$0
OTOLITH MARKING						
ADFG	$0	$ 6	$ 6	$ 6	$ 92	$ 92
PWSAC/VFDA	0	6	6	96	222	321
Trustee Council	**0**	**651**	**90**	**100**	**249**	**0**
Subtotal:	$0	$663	$102	$202	$563	$413
TOTALS						
ADFG	$ 82	$ 76	$102	$ 92	$ 92	$ 92
PWSAC/VFDA	276	282	282	222	222	321
Trustee Council	**249**	**900**	**339**	**349**	**249**	**0**
Total:	$607	$1,258	$723	$603	$563	$413

GENETICS AND STOCK STRUCTURE INVESTIGATIONS. In FY 94, the Trustee Council began a three-year program to delineate the genetic structure of populations of wild pink salmon in Prince William Sound, Project 320D, Pink Salmon Genetics. Understanding genetic structure of the stocks is critical to their management and conservation. Managing for a specific genetic stock that is not distinct may adversely affect the fishing industry and waste management resources, while not managing for specific stocks that do exist may result in the loss of the stock or the loss of genetic diversity. The final year of this effort is expected to be FY 96.

IMPROVED ESCAPEMENT GOALS. In 1989 through 1992, NRDA Study F/S 3 used aerial surveys, beachwalks, and temporary weir sites to gather detailed information concerning wild stock escapements. The information allowed salmon managers to revise wild stock escapement goals, and to refine techniques for estimating escapement. Increased accuracy in setting escapement goals and escapement is a permanent improvement to the management of pink salmon wild stocks.

Summary: Supplementation for Pink Salmon

RECOVERY OBJECTIVES. Projects in this section contribute to the recovery of pink salmon by:

- providing biologically self-sustaining, on-site increases in natural populations of injured resources; or
- providing alternative resources for subsistence, sport, or commercial harvest.

FINDINGS AND ACCOMPLISHMENTS.

- In 1994 and 1995, the USFS will have completed construction of four projects to provide access to additional spawning or rearing habitat throughout the spill area for pink, coho, sockeye, and chum salmon and for Dolly Varden trout.

FY 96 AND BEYOND

- Monitor fish habitat projects to evaluate their physical and biological success. (Monitoring is expected to use a combination of agency and Trustee Council funds for two years).
- Evaluate for funding: Lowe River habitat improvement and Little Port Dick habitat improvement.
- Continue planning and evaluation for supplementation to protect Prince William Sound pink salmon:
  - Assess whether remote release of hatchery salmon or adjustments in hatchery run timing can be used to help separate harvest of wild and hatchery runs of pink salmon;
  - Design experiment to determine how much gene flow occurs within and between natural and hatchery populations, and whether restoration using remote releases would affect wild pink salmon populations.

COST ESTIMATES AND TIMELINES

	Approved Restoration Projects, FY 92 - 95:	$714,400
FY 96 - 97	Monitoring fish habitat projects	$10,000
	Total:	$715,400

FY 92 - 95 costs include Project 94043 which targets cutthroat and Dolly Varden habitat, but was combined with salmon in-stream restoration projects in 1994. The table does *not* include potential future costs for two supplementation projects being evaluated, (Lowe River and Port Dick) nor for the hatchery remote release program currently being evaluated through Project 95093.

Discussion

Supplementation describes artificial techniques that provide on-site survival benefits to natural fish populations. By this definition, supplementation must provide benefits to natural populations in the localities where they complete their life cycle. Examples of supplementation include constructing spawning channels to increase spawning habitat, using rearing pens to increase marine survival, or providing remote-release salmon runs for the purpose of drawing fishing pressure away from injured wild stocks.

The Trustee Council recognizes that supplementation techniques are important tools for restoration of certain fish stocks. However, supplementation also has the potential to injure stocks of fish. Because of this potential, each supplementation proposal must show that they do not carry unacceptable risks.

SUPPLEMENTATION CRITERIA. To explore the opportunities and potential risks of supplementation, the Trustee Council sponsored a workshop on the subject in January 1995. The criteria and guidelines developed in the workshop will be used by the Trustee Council when considering supplementation projects for possible Trustee Council funding. They are summarized below.

Benefits of Supplementation. To be considered for Trustee Council funding, a supplementation proposal must demonstrate that its benefits outweigh its risks. Examples of benefits are rehabilitating of wild populations, providing additional population for harvest, or protecting subpopulations that may be in danger of extinction.

Genetic Risk. Genetic risk involves risk to the natural stocks being targeted, or to other non-targeted stocks. Genetic risk operates through the forces of natural selection, genetic drift, gene flow and mutation. The risks may have the effect of decreasing the adaptation of natural populations to their environment, or making them more vulnerable to natural and human changes. The risks include: loss of genetic variation within natural breeding populations; changes in genetic composition of the population through natural selection; or hybridization of the natural stock with supplemental stock of a different genetic character. All of these can lead to poor survival in future generations and loss of production. They can also make a local population less able to rebound from a change such as a year of overharvest, or a year of poor survival at sea. If a population or subpopulation has not been reduced from historic population levels, and is not in danger of extinction, supplementation proposals that involve significant genetic risk are not likely to be funded by the Trustee Council.

Mixed-stock Fisheries. Supplementation proposals must not create or exacerbate problems in mixed-stock fisheries. Mixed-stock fisheries, like those of Prince William Sound, create the potential for additional risk and benefits. In some circumstances, the pressure for additional harvest that accompanies successful supplementation may cause overharvest of an unsupplemented stock. For example, pink salmon returns to the Coghill District of Prince William Sound have not always met escapement goals. Fish returning to this district must

"run the gauntlet" of fishing vessels in the southwest and western parts of Prince William Sound at the time when the fleet is focused on the large hatchery return in these areas. Thus, supplementation that increases the concentration of fishing vessels in this district has the potential to exacerbate this problem. Conversely, supplementation efforts, including techniques such as establishing alternative remote-release runs, which draw the fleet from these areas, may have the effect of allowing the Coghill District stocks to more regularly meet escapement goals.

Monitoring and Evaluation. Because of the potential for significant risk an evaluation program is necessary to assess the likelihood of success and potential for risk. Once a proposal is implemented, monitoring is necessary to assess whether the program succeeded and whether significant harm was avoided. The degree of evaluation and monitoring should be dependent upon the level of risk. Those proposing higher risk projects should be willing to incur higher monitoring and evaluation costs than those proposing projects with lesser potential risk.

Economic Criteria. To the extent it is available, information regarding the economic costs and benefits of a project must be provided for the Trustee Council to evaluate a project. However, quantifiable economic data may not capture intangible values, such as the value of preventing the extinction of a subpopulation of a resource, and the Trustee Council may elect to approve a project with a quantified benefit/cost ratio of less than one after considering these non-quantified values.

Procedural Criteria. The State of Alaska requires permits for some types of supplementation: for example, a fish transport permit, or approval by the Regional (Salmon) Planning Team. These permits bring the substantial expertise of Alaska fisheries managers to the evaluation of supplementation projects. Proposals for Trustee Council funding should have cleared these requirements *before* the Council is asked to approve a project. Federal law requires an evaluation of potential environmental effects according to the standards of the National Environmental Policy Act. Because of the potential for risk, the analysis may require significant cost or time, but it must be completed before a final decision is made concerning funding a supplementation project.

CURRENT SALMON SUPPLEMENTATION EFFORTS. Projects 94139 and 95139 use physical habitat improvements to increase spawning and rearing habitat for pink, coho, sockeye, and chum salmon, and Dolly Varden trout. They are intended to augment populations injured by the oil spill, or to provide additional stock for commercial and sport fishing. In these locations the techniques have little risk to other salmon populations. Construction of some projects began in 1994; for all projects, construction is expected to be completed in 1995.

- Little Waterfall Creek, Afognak Island (139A1). Increases spawning and rearing habitat for pink and coho salmon to provide additional harvest stocks, primarily for the commercial fleet.
- Otter Creek, Knight Island, Prince William Sound (139B1). Modifies existing fishway previously constructed by USFS so that pink salmon can access additional spawning habitat, thereby providing protection for wild stocks.

- Shrode Lake, Culross Island, Prince William Sound (139B2). Rehabilitates a USFS barrier by-pass constructed in the 1960s. The project will extend the life of the fishway by five years. It allows coho, pink, and sockeye salmon, and Dolly Varden trout continued access to spawning habitat.
- Montague Island Rehabilitation, Prince William Sound (139C1). Improves spawning and rearing habitat for pink and chum salmon by putting structures emulating large woody debris in streams of 1960s logging area (on USFS land). The project includes four streams. The USFS has successfully used these techniques in the Pacific Northwest, and in a few smaller streams in Prince William Sound, but has not used them in larger streams in remote areas subject to strong and variable streamflows. The application of these techniques are being monitored, and if successful, they may be applicable elsewhere in the spill area.

HABITAT IMPROVEMENT PROJECTS EVALUATED IN 1994 AND 1995. ADF&G is evaluating two additional salmon supplementation projects in 1995. Because the evaluations are not complete, it is not possible to forecast whether additional funds will be requested.

Lowe River. An environmental assessment of an artificial spawning channel for the Lowe River near Valdez was funded as part of Project 94139. The project was intended to create additional spawning habitat for pink, coho, and chum salmon to benefit sport fishing, viewing, and commercial fishing in the Valdez area. The assessment raised questions as to the efficacy of the project, and identified potential negative effect on existing stock. The project is being re-evaluated, and it is unknown whether additional work will be proposed.

Port Dick Spawning Channel. Port Dick Creek on the outside of the Lower Kenai Peninsula was uplifted during the 1964 earthquake and has had depressed pink and chum salmon stocks since that time. The project is currently being reevaluated.

ALTERNATIVE HATCHERY RELEASE SITES. Most pink salmon returning to Prince William Sound enter the Sound through the southwest district and then proceed to their natal streams or to one of the Sound's four pink salmon hatcheries. Despite the efforts of hatchery managers to use timing to separate hatchery returns of pink salmon from wild returns, the coincident concentration of hatchery and wild returns makes separating them a difficult management task. In some years, the consequences of not separating the runs can be severe: either the wild stocks are exploited too heavily, or the hatchery stocks must be harvested in a terminal fishery near the hatchery which causes significant congestion problems.

In FY 95, Project 95093 is examining alternative remote release sites for pink salmon hatchery releases by the Prince William Sound Aquaculture Corporation. If properly situated in an area with minimal natural runs, the release could geographically separate the hatchery and wild stocks, thus minimizing the problem. The effort may also identify possible run timing adjustments as a means of reducing wild/hatchery stock interactions in the fishery.

Project 93093, in addition to examining remote release sites for hatchery salmon, is al assessing whether experiments can assess gene flow within and between natural and hatche populations. If feasible, the experiments would assess how much gene flow occurs natural and whether restoration using remote releases would result in additional gene flow into wi populations.

The planning process is currently at its early stage and it is not yet possible to forecast t future cost, schedule, or endpoint of this project.

NOTES FOR THE TABLE ON THE NEXT PAGE. The cost for Project 94139 includes that f Project 94034, Cutthroat and Dolly Habitat Restoration in PWS. The cost for the tv projects were combined in 1994 but separated in 1995.

Future costs in the table do not include two habitat improvement projects being evaluate nor future costs associated with Project 95093.

PAST AUTHORIZATIONS

R 60 AB	Pink Salmon	$1,421,800	
R 60 C	Injury to Egg and Preemergent Fry in PWS	$412,900	
93003	Egg to Preemergent Fry Survival in PWS	$699,000	
93067	PWS Coded-wire Tag	$148,600	
94139	Salmon Instream Habitat and Stock Restoration	$344,800	
94191	Oil Related Egg and Alevin Mortalities	$880,700	
94320B	Coded Wire Tag Recover	$196,600	
94320C	Otolith Mass Marking	$53,900	
94320D	Pink Salmon Genetics	$171,200	
95076	Effect of Oiled Incubation Substrate on Survival and Straying of Wild Pink Salmon (Laboratory)	$179,900	
95093	PWSAC: Pink Salmon Restoration	$100,000	
95139	Salmon Instream Habitat and Stock Restoration	$319,000	
95191A	Oil Related Egg and Alevin Mortalities (field)	$475,100	
95191B	Injury to Salmon Eggs and Pre-emergent Fry Incubated in Oiled Gravel (Laboratory)	$331,000	
95320B	Coded Wire Tag Recovery	$260,500	
95320C	Otolith Mass Marking	$651,000	
95320D	Pink Salmon Genetics	$227,000	
	Subtotal of Past Authorizations:		$6,873,000

FY 96 AND BEYOND

FY 96	\039 Monitoring (Montague Island)	$5,000	
	\076 Effect...on Survival and Straying (lab)	$327,500	
	\191A Egg and Alevin Mortalities (field)	$350,000	
	\191B Egg and Alevin Mortalities (lab)	$497,100	
	\320B Coded Wire Tag Recovery	$249,000	
	\320C Otolith Mass Marking	$90,000	
	\320D Pink Salmon Genetics	$130,000	
	FY 96:		$1,648,600
FY 97	\039 Monitoring (Montague Island)	$5,000	
	\076 Effect...on Survival and Straying (lab)	$424,300	
	\191A Egg and Alevin Mortalities (field)	$350,000	
	\191B Egg and Alevin Mortalities (lab)	$123,000	
	\320B Coded Wire Tag Recovery	$249,000	
	\320C Otolith Mass Marking	$100,000	
FY98	\076 Effect...on Survival and Straying (lab)	$314,700	
	\191A Closeout: Egg & Alevin Mort. (field)	$100,000	
	\191B Egg and Alevin Mortalities (lab)	$181,000	
	\320B Coded Wire Tag Recovery	$249,000	
	\320C Otolith Mass Marking	$100,000	
FY 99	\076 Closeout: Effect...on Survival and Straying (lab)	$245,200	
	\191B Closeout: Egg and Alevin Mort. (lab)	$47,000	
	Subtotal FY 97-99:		$2,488,200
	Total:		$11,009,800

Pacific Herring

Summary

RECOVERY OBJECTIVES. Pacific herring will have recovered when populations are healthy and productive and exist at prespill abundances.

Projects discussed in this section help accomplish this objective by conducting research into why Pacific herring are not recovering, monitoring their recovery, and improving management tools. In addition to the projects discussed in this section, the Sound Ecosystem Assessment (SEA) examines ecosystem processes that affect Pacific herring and pink salmon and is discussed on page 43.

FINDINGS AND ACCOMPLISHMENTS

- The herring biomass has declined by over 75 percent from the record biomass in 1992 of over 100,000 tons. This precipitous decline was first observed in the spring of 1993.
- High concentrations of *viral hemorrhagic septicemia* (VHS) were identified in pooled samples of spawning herring in 1993.
- In 1994, the fungus *Ichthyophonus* was discovered in 29% of the herring sampled.
- A 1994 laboratory study found that exposure of adult herring to oil resulted in a "dose relationship" to disease. Further study is indicated.
- A 1994 laboratory study found no indication that exposure of adult herring to oil caused chromosomal damage in progeny. Researchers infer that heritable genetic damage from exposed adults was unlikely. Investigations continue.

FY 96 AND BEYOND

- Close out research on reproductive impairment (Project 074).
- Continue genetic stock identification (Project 165), contingent on FY 95 results.
- Continue research on disease impact (Project 320-S), contingent on FY 96 results. Close out in FY 98.
- Continue egg deposition surveys (Project 166).
- In FY 97, initiate an annual survey of juvenile herring.

COST ESTIMATES AND TIMELINES

	Approved Restoration Projects, FY 92–95:		$1,993,800
FY 96	Closeout: Herring Reproductive Impairment	$407,000	
FY 96	Closeout: Herring Genetic Stock Identification	$97,000	
FY 96-97	Herring Natal Habitat	$843,000	
FY 96-98	Herring Disease	$1,200,000	
	Subtotal FY 96–98:		$2,547,000
	Total:		$4,540,800

Discussion

The herring biomass has declined by over 75 percent from the record biomass in 1992 of over 100,000 tons. This precipitous decline was first observed in the spring of 1993. Low stock abundance continued during 1994.

These marked declines in the Prince William Sound herring population have had profound impacts on the region's economy. The commercial herring fishery was curtailed in 1993 and eliminated in 1994. The Alaska Department of Fish and Game announced in January that there will be no commercial herring fishery in 1995.

Herring is also an important food source for injured predators that are not recovering, such as harbor seals and some seabirds. The sharp decline in the Prince William Sound herring population may be a factor limiting recovery of these resources.

Restoration of herring consists of research into why they are not recovering and efforts to improve management of the herring fishery.

RESEARCH. The Sound Ecosystem Assessment (SEA) examines ecosystem processes that affect Pacific herring and pink salmon. SEA examines such factors as the effect of physical transport processes and avian predation on herring egg mortality; the effect of the spring plankton bloom on the rate of predation on young herring; and overwinter survival of juvenile herring and its effects on adult reproduction. SEA is discussed in greater detail on page 43.

Two additional factors that may be limiting recovery of herring are:

- the effects of disease on population size, and
- the effects of oil on herring reproduction.

Herring Disease (Project 94320-S). *Viral hemorrhagic septicemia* (VHS) was the only significant pathogen isolated from the herring that returned to spawning grounds in 1993. After the failure of the herring run in 1994, Project 94320-S was initiated to investigate the impact of disease on the decline of Pacific herring in Prince William Sound. Researchers concluded that VHS was probably not the primary cause of morbidity before spawning in 1994, although its role before spawning in 1993 is unknown. However, researchers found an unusually high incidence (29%) of lesions associated with *Ichthyophonus* infection among herring sampled in 1994.

Project 95320-S will further investigate the impact of disease on herring populations in Prince William Sound. A request for proposals was recently issued. It calls for exposure tests, which require a specific pathogen-free stock. Because the contractor must create the pathogen-free stock, it is not expected to be available for testing until FY 96. Consequently, Project 95320-S will continue until at least FY 97. Continuation of the project beyond FY 97 will be contingent on FY 96 results.

Reproductive Impairment (Project 074). A significant proportion of the pre-spawning adult herring population in Prince William Sound was likely exposed to oil spilled by the *Exxon Valdez*. In 1994, the effect of exposure to oil on progeny was investigated. There was no indication that exposure of adult herring to oil caused chromosomal damage in progeny. Researchers infer that heritable genetic damage from oil-exposed adults was unlikely.

Laboratory research in 1995 will focus on direct exposure of developing herring eggs to oiled water; the concept of genetic damage from oil-exposed eggs will be examined. Preliminary observations suggest that direct exposure of eggs to oil will cause morphological damage. Herring larvae will be examined for evidence of chromosomal damage. The Chief Scientist has recommended that this project be closed out in FY 96.

IMPROVED FISHERIES MANAGEMENT. Although the aerial survey that Alaska Department of Fish and Game conducts each year is a useful management tool, additional information is needed to improve management of the herring fishery. Techniques for obtaining this information include the following:

- herring spawn deposition surveys,
- annual surveys of juvenile herring, and
- genetic stock identification.

The projects described below develop and refine these techniques. Eventually, these efforts will be incorporated into normal agency management.

Herring Spawn Deposition / Natal Habitat (Project 166). The primary goal of this project is to estimate the biomass of all spawning herring in Prince William Sound using estimates of eggs deposited on spawning grounds. Projections are used to set commercial harvest guidelines. The best estimates of historic abundance trajectories indicate a peak spawning biomass of 121,000 tons in 1989. The total length of shoreline receiving spawn in 1994 was 23.6 km and was the lowest amount of shoreline spawning observed since surveys were initiated in the early 1970's. Egg densities in survey areas were generally lower than in previous years of spawn deposition surveys.

The Chief Scientist has recommended that spawn deposition surveys and historical habitat database development be continued to provide the basic information on spawning adult biomass for Prince William Sound.

Annual Survey of Juvenile Herring. While egg deposition is a useful tool for estimating the size of the adult spawning biomass, the best predictor of the strength of a year class is the abundance of juveniles that are less than a year old. These data are currently not being collected. By approving Project 95320-T, the Trustee Council laid the foundation for a program to obtain information on juvenile herring. By FY 96, this project is expected to develop indexing stations for use in sampling of juvenile herring. An annual survey of juvenile herring will probably begin in FY 97 as part of Project 320-T.

Genetic Stock Identification (Project 165). Incorporating genetically derived stock structure is crucial to the success of any fishery management or restoration program. Consistent exploitation of mixed stocks tends to lead to the demise of the least productive stock.

The Alaska Department of Fish and Game has synthesized current thinking about Prince William Sound stock structure and movement. A draft document has been circulated for review and will be revised in response to comments received.

The next step is to determine if there are definable substocks of Pacific herring in Prince William Sound. Project 165 was first approved in FY 94, but the herring run failure in 1994 disrupted the schedule for collecting samples. Nonetheless, some samples were collected in 1994. The Alaska Department of Fish and Game expects to complete the analysis of these samples by Spring 1995. Project 165 was reauthorized in FY 95. Continuation will depend on FY 95 results.

Herring Restoration Projects

FY 92 THROUGH FY 95			
94165	Herring Genetic Stock Identification in PWS	$42,200	
94166	Herring Spawn Deposition and Reproductive Impairment	$466,300	
95074	Herring Reproductive Impairment	$407,100	
95165	Herring Genetic Stock Identification	$165,400	
95166	Herring Natal Habitats	$512,800	
95320-S	Herring Disease	$400,000	
	Subtotal FY 92–95:		$1,993,800
FY 96 AND BEYOND			
FY 96	074 / Closeout: Herring Reproductive Impairment	$407,000	
FY 96	165 / Herring Genetic Stock Identification	$97,000	
FY 96	166 / Herring Natal Habitats	$493,000	
FY 96	320-S / Herring Disease	$400,000	
	Subtotal FY 96:		$1,397,000
FY 97	166 / Herring Natal Habitats	$350,000	
FY 97	320-S / Herring Disease	$400,000	
FY 98	320-S / Closeout: Herring Disease	$400,000	
	Subtotal FY 97–98:		$1,150,000
	Total:		$4,540,800

Sound Ecosystem Assessment

Summary

RECOVERY OBJECTIVES. The objective of the Sound Ecosystem Assessment (or "SEA") is to provide information needed for the informed restoration of pink salmon and Pacific herring in Prince William Sound. The recovery objectives under the SEA Plan include:

- Pink salmon will have recovered when populations are healthy and productive and exist at prespill abundance; and
- Pacific herring will have recovered when populations are healthy and productive and exist at prespill abundances.

FINDINGS AND ACCOMPLISHMENTS. The first field season for the project (FY 94) was largely devoted to mobilization and deployment. Initial findings include:

- Upper-layer circulation in the region differs between the northern and southern portions of the Sound (a generally westward flow occurs in the south while upper-layer circulation in the northwestern Sound is weak and variable) and a previously unknown sub-surface flow counter to the surface currents has been detected;
- The timing and duration of the upper-layer large calanoid copepod bloom was earlier and stronger in the northern Sound than in the south while observations at the AFK hatchery indicated river-like conditions, but not extreme flushing;
- During the peak of the large calanoid copepod bloom, most of the larger fishes caught in seines and trawls were feeding intensively on copepods and predation of 0–class fishes was markedly reduced, suggesting support for the "prey-switching" hypothesis;
- The timing of the annual spring phytoplankton bloom was delayed relative to 1993 by about two weeks and preliminary analysis implicates temperature differences affecting upper layer stability as a major factor.
- Few juvenile pink salmon larger than 60 - 65 millimeters were found in the stomachs of larger fishes (walleye pollock and herring) indicating that once the fry reach this length, they are less vulnerable.
- Large numbers of walleye pollock were discovered in PWS and appear to play a key role in the ecosystem as a predator of juvenile salmon;
- Isotope measurements of an array of plankton, fishes, micronekton and squids support what was suspected to be the major trophic relationships;

- Observations of large numbers of jellyfish suggest another competitor for zooplankton and signal the need to understand the contribution of these populations to the ecosystem as it relates to pink salmon and herring.

- Large numbers of squid were taken in mid-water trawls in April, May and June (squids sometimes exceeded the number of walleye pollock) and stomach content analysis provides new insight on juvenile fish survival in relation to squid predation.

FY 96 AND BEYOND

- The SEA program effort is anticipated to continue for another three years through FY 98, perhaps longer. The results of the first two years (FY 94-95) will be essential to determining the scope of work under this project in the future (FY 96-98).

- Future funding over the period FY 96 - 98 is estimated at a total of approximately $10.8 million.

COST ESTIMATES AND TIMELINES

FY 94-FY 95:		$ 10,541,100
FY 96-FY 98:		$ 10,800,000
	Total:	$21,341,100

Note: FY 94-FY 95 total exclusive of 320-B/CWT Recovery from Pink Salmon; 320-C/Otolith Mass Marking; 320D/Pink Salmon Genetics; and 94320-S/Herring Disease. For discussion of these projects, see Pink Salmon (p. 23) and Pacific Herring (p. 39).

Discussion

Extremely poor PWS pink salmon runs in 1992 and 1993, a virtual collapse of the PWS herring fishery in 1993, and the long-term decline of certain marine mammal and seabird populations within the spill area have resulted in a recognition of the need to consider broad scale ecosystem processes as part of the restoration process.

In late 1993, a collaborative effort involving University of Alaska researchers, Alaska Department of Fish and Game resource managers, the Prince William Sound Science Center researchers, and commercial fishers resulted in the development of an ecosystem research concept focused upon pink salmon and herring in PWS. After substantial Trustee Council sponsored review, funding for this Sound Ecosystem Assessment (or "SEA") program was approved April 11, 1994.

SEA RESEARCH GOALS. A fundamental premise of the SEA research effort is that information regarding ecosystem-level relationships that influence or control the production of pink salmon and herring is needed for effective restoration of these species. The stated research goals for the SEA program are to:

- **acquire an ecosystem-level understanding of processes** that interact to maintain the production of pink salmon and herring within natural limits of variability;
- **use this new information to develop improved predictors** of annual levels of pink salmon and herring production; and
- **establish a detailed and comprehensive data base** for application to the restoration of these and other injured resources in PWS.

The SEA program is designed to obtain an understanding of the mechanisms that establish levels of adult production for pink salmon and herring in PWS by investigation of the early life stages of these species.

THE SEA HYPOTHESES — PINK SALMON AND HERRING. The SEA research effort is organized around four central groups of hypotheses regarding the function and structure of the PWS ecosystem relative to survival of pink salmon and herring during the critical early life stages for each species. It is thought that the greatest losses to the populations of these species occur during the early life stages (embryos, larvae, and early post-larvae) and this accounts for most of the mortality leading to adult production — the first few weeks of coastal ocean life in the case of pink salmon and the first two years for longer-lived herring.

The SEA program is focused on those times and places hypothesized as "major survival bottlenecks" during the early marine life history of pink salmon and herring. These "survival bottlenecks" (habitat dependencies including predator-prey relationships) are thought to include the freshwater and nearshore natal and rearing habitats for pink salmon

and herring; the migratory corridors taken by fry as they transit and exit PWS in the spring and summer; and shallow overwintering habitats used by juvenile herring.

These central hypotheses are:

1) Herring Natal Habitat Hypotheses;
2) Predator-Prey Hypotheses;
3) Oceanography-Lake/River Hypotheses; and
4) Juvenile Herring Overwintering Hypotheses.

Herring Natal Habitat Hypotheses — Mortality rates of herring embryos in natal habitats may establish overall recruitment in some years. Physical removal/destruction of spawn (from wave action, temperature extremes and ultraviolet radiation) and avian predation are thought to be the main causes of herring egg mortality and associated recruitment losses.

FY 95 SEA projects that address the Herring Natal Habitat Hypotheses include work under 95320M, 95320J, 95320I, and 95320Q. (See also the discussion of 95166 within Pacific herring on p. 39.)

Predator-Prey Hypotheses — Much of the variability in annual survival of juvenile pink salmon and herring is thought to be determined during the time of early marine residence. The major loss factor is believed to be predation. Growth rates are believed to mediate predation, that is, slower growing, smaller, slower swimming individuals are thought to be a greater risk than faster growing individuals. More than 75% of juvenile salmon consumed by fish predators may be smaller than 60 millimeters. Walleye pollock and seabirds are thought to be the principal predators on juvenile salmon during the first 30 days of marine residence. After 30 days, walleye pollock, older herring and adult salmon are believed to be the principal predators.

The rate of predation upon pink salmon fry, young herring and other juvenile (age 0) fish is believed to be strongly affected by the timing and duration of the spring macrozooplankton bloom. During the April/May macrozooplankton bloom, predators consume large calanoid copepods and other zooplankton and predation on age 0 fish is relatively low. As the abundance of macrozooplankton declines, predation appears to switch to age 0 fish, including juvenile pink salmon and herring. Accordingly, survival of juvenile pink salmon and herring appears to depend in significant part upon their growth rate prior to reaching a size of approximately 60 millimeters. Springtime ocean temperatures are thought to largely control juvenile salmon growth rates as well as the timing and strength of the annual zooplankton bloom.

During years of high zooplankton abundance, all consumers (including age 0 fishes) derive substantial nutrition from zooplankton. Under these conditions, juvenile salmon and larval/post-larval herring are "sheltered" from predation and losses to larger fishes are minimized. Conversely, it is thought that during times when macrozooplankton populations are weak, larger predators switch from feeding on zooplankton (planktivory) to feeding on small fishes (piscivory) resulting in greater losses to pink salmon and herring.

It is also thought that the carrying capacity of PWS for juvenile salmon may be limited by the availability of "predation refuges." These refuges can be identified both geographically as well as in terms of the timing of juvenile salmon migration through PWS. In geographic terms, juvenile salmon transiting PWS are believed to occupy nearshore habitats that provide a degree of refuge from predators that tend to occupy offshore areas where there are greater zooplankton concentrations. Increased juvenile salmon density (total numbers of fry) in the nearshore areas is thought to result in greater competition among juvenile salmon for food resources forcing longer juvenile salmon foraging time outside of the nearshore "predation refuges" and greater predation risk. The degree of refuge provided by nearshore habitats is thought to be significantly reduced as fish predators move into nearshore nursery areas in May to June as a function of ocean temperatures.

Predation on wild salmon fry is also speculated to be greater when wild fry are mixed with larger hatchery-reared fry in nearshore habitats. The presence of large numbers of fry are thought to attract predator aggregations which may select smaller, less mobile wild fry.

FY 95 SEA projects that address the Predator-Prey Hypotheses include work under 95320A, 95320E, 95320J, 95320K, 95320M, 95320N, 95320H, and 95320Y. (See also the discussion of 95320B, 95320C within Pink Salmon on p. 23.)

Oceanography-Lake/River Hypotheses — The macrozooplankton available to planktivores (fishes, birds, mammals) in PWS is thought to be substantially influenced by physical transport processes (ocean currents and winds). These processes that can either bring zooplankton into the PWS region from the bordering Gulf of Alaska or, possibly, flush macrozooplankton populations from the Sound. Production of macrozooplankton is further modified by local levels of primary productivity.

In some years, PWS is thought to be more "river like" in that currents and/or winds may flush the waters of PWS and at the same time reduce the availability of near surface macrozooplankton to predators. Conversely, in some years, PWS may be more "lake like" in that currents and/or winds do not flush the Sound, leaving resident populations of macrozooplankton available to predators. Physical oceanographic and meteorological processes that control the transport of waters (and macrozooplankton) in PWS are the subject of investigations to address the "lake-river" hypotheses and the associated implications for prey availability to planktonic predators.

Because herring exist in a free-drifting, planktonic stage for a significant period of time during their early marine residence, the lake-river model also has important implications for herring recruitment.

FY 95 SEA projects that address the Lake-River Hypotheses include work under 95320E, 95320G, 95320H, 95320I, 95320J, and 95320M.

Juvenile Herring Overwintering Hypotheses — At present, very little is known about overwintering habitat utilized by 0-class and 1+ juvenile herring in PWS. Following the free-drifting, planktonic stage, juvenile herring are believed to migrate into nearshore nursery

habitats. Of particular concern is the influence of ocean temperatures on the depletion of juvenile herring energy reserves. Investigations being initiated in FY 95 as part of the SEA program will attempt to locate and characterize juvenile herring overwintering habitats (95320T) and examine the bioenergetics of herring (95320U).

FY 95 SEA projects that address the Juvenile Overwintering Hypotheses include work under: 95320H, 95320J, 95320M, 95320N, 95320T, 95320U. (See also the discussion of 95166 and 95320S within Pacific Herring on p. 39.)

CHIEF SCIENTIST/PEER REVIEW OF THE FY 94 SEA PROGRAM. Since the SEA program was authorized in April 1994, it has gathered a large volume of data. Monthly field cruises involving up to six vessels were deployed; nearly 1,000 conductivity, temperature, depth (CTD) measurements collected; 900 samples of phytoplankton and nutrients, 390 samples of zooplankton and micronekton and nearly 7,000 stomachs from large fishes were obtained in 216 midwater trawls and nearly 500 seine sets; about 1,700 km of acoustic track lines on 88 transects were obtained; 170 km of aerial bird surveys; 500 samples of fish and plankton for stable isotopes of carbon and nitrogen were analyzed; and continuous hourly weather and upper-layer temperatures and fluorescence recorded from a real-time mooring. Additionally, a functioning data collection and computing center was established in Cordova with local and area-wide networks with Internet access, capable of receiving and analyzing large volumes of field data.

A peer review workshop on the FY 94 SEA program was held October 4 - 6, 1994 in Cordova. Recommendations from that peer review included:

- *Preparation of an Integrated Detailed Study Plan.* The Chief Scientist directed that a single, integrated DPD be prepared for FY 95. (A single, integrated DPD was submitted in early February 1995.)

- *Hatchery vs. Wild Populations.* Reviewers noted the need to carefully consider the applicability of studying hatchery populations as models for all juvenile salmon in PWS.

- *New Equipment.* The need for careful review of new and expensive equipment purchases was emphasized.

- *Hydroacoustic Data.* The review cited the need for an explicit plan to describe how the electronic data obtained from hydroacoustic surveys will be translated into biologically meaningful information. (A three day hydroacoustic workshop will be held March 28 - 30.)

- *Interaction of Modeling and Field Data.* The review indicated that the modeling component of the project "... must identify interim modeling products that can be used to assess our ability to simulate PWS [and] these interim products should be part of an overall modeling plan that identifies which components of the comprehensive numerical model will be developed first and how these components will be applied."

- *Executive Committee.* The review recommended creation of an Executive Committee and that decision-making authority for the project should be concentrated to allow for a more efficient management process. (An Executive Committee was created in December 1994.)

- *Juvenile Salmon Sampling.* A need to indicate how the "leading edge" sampling of salmon fry controls for bias in the movement of different sized fry was noted.

- *Herring Projects.* The integrated detailed study plan should provide a clear focus for the herring projects within the SEA program and reflect the growing consensus that egg loss/embryo survival is not as important to herring recruitment as juvenile herring survival.

FUTURE SEA PROGRAM RESEARCH AND MONITORING. The science plan for the SEA program effort has been developed as a multi-year "phased" effort that emphasizes field data collection regarding physical ecosystem processes and mechanisms during the initial years, followed by numerical modeling in later years with a final transition to index site monitoring. The SEA program effort is anticipated to continue for another three years through FY 98, perhaps longer. The results of the first two years (FY 94 - FY 95) will be used to determine the scope of work under this project in the future.

Future funding over the next three fiscal years (FY 96 - FY 98) is estimated at approximately $10.8 million. Program findings and accomplishments will be reassessed each year and the program modified accordingly. Future consideration of long-term SEA needs will include efforts to secure funding sources to complement the use of settlement funds.

OTHER PINK SALMON AND HERRING RESTORATION PROJECTS. In addition to the SEA program, there are several other Trustee Council restoration efforts addressing pink salmon (including toxic effects of oil; stock separation and management; and supplementation) and herring (including reproductive impairment; stock separation and management; herring disease; and herring natal habitat investigations). For a discussion of these other projects, see the sections on Pink Salmon (page 23) and Pacific Herring (page 39).

Table 4. Sound Ecosystem Assessment: FY 94 - FY 98

(budget figures in $000s)

Project Number/Title	Agency or Organization	FY 94	FY 95	Herring Natal	Predator Prey	River Lake	Herring Overwinter	FY 96*	FY 97	FY 98	Project Duration (94-98)
320-A/Salmon Growth and Mortality	ADF&G	263.4	267.8		X			267.8	**	**	5 yrs
320-E/Salmon Predation	ADF&G	907.1	943.1		X	X		943.1	**	**	5 yrs
320-F/Harbor Seals-Trophic Interactions	ADF&G	26.0 (1)	—					—	—	—	5 yrs
320-G/Phytoplankton and Nutrients	UAF	141.5	239.3			X		239.3	**	**	5 yrs
320-H/Zooplankton in Ecosystem	UAF	300.1	247.4		X	X	X	247.4	**	**	5 yrs
320-I/Trophic-Stable Isotopes	UAF	60.5	230.0 (2)	X	X	X		230.0	**	**	5 yrs
320-J/Information Systems-Modeling	PWSSC	756.5	836.2	X	X	X	X	836.2	**	**	5 yrs
320-K/PWSAC-Salmon Fry Experimental Release	PWSAC	46.6	47.3		X			47.3	**	**	5 yrs
320-L/PWSAC-Salmon Fry Experimental Manipulation	PWSAC	1,750.0 (3)	—					—	—	—	5 yrs
320-M/Physical Oceanography	PWSSC	773.1	577.8	X	X	X	X	577.8	**	**	5 yrs
320-N/Nearshore Fish	PWSSC	666.9	635.2		X		X	635.2	**	**	5 yrs
320-P/Program Management	PWSSC	151.8	—					—	—	—	5 yrs
320-Q/Avian Predation on Herring Spawn	USFS	84.8	99.0	X	X			99.0	**	**	5 yrs
320-T/Juvenile Herring Growth-Habitat Partitioning	UAF	—	340.3				X	340.3	**	**	5 yrs
320-U/Somatic-Spawning Energetics: Herring/Pollock	UAF	—	99.4				X	99.4	**	**	5 yrs
320-Y/Variation in Predation on Hatchery Fry	PWSSC	—	50.0		X			50.0	**	**	5 yrs
	Subtotal:	**5,928.3** (4)	**4,612.8**					**4,600.0***	**3,600.0***	**2,600.0***	**5 years**

1 Project 94320-F was not continued during FY 95 as part of the SEA program. In FY 95, however, a separate but complementary marine mammal research effort has been organized to address harbor seal restoration and related issues (see Projects 95001, 95064, 95112, and 95117BAA).

2 FY 95 budget figure for 95320-I includes total funding for both Project 95320-I ($200.0) as well as interim funding authorized for Project 95320-I(2) ($30.0).

3 Project 95320-L/Experimental Manipulation was funded in FY 94 as a one-year initial year research component of the SEA effort.

4 The first year of the SEA effort in FY 94 included a total funding authorization of $6,397.8. In addition to the FY 94 projects noted above, this included Projects 94320B/Coded Wire Tag Recovery from Pink Salmon in PWS ($244.4); 94320C/Otolith Mass Marking ($53.9); and 94320D/Pink Salmon Genetics ($171.2). Additionally, Project 94320S/Herring Disease ($97.0) was initiated during FY 94 as part of 94320. Each of these four other projects is being carried forward in FY 95 as studies independent of, but closely affiliated with, the SEA program. For information regarding these for projects, see discussion of Pink Salmon (page 23) and discussion of Pacific Herring (page 39).

* Estimate. FY 96 project budgets reflected in this table equal FY 95 budgets. Future funding subject to findings of project and on-going peer review process.

** Undetermined. The SEA program effort is anticipated to continue for another three years through FY 98, perhaps longer. Future funding over the next three years is estimated at approximately $10.8 million. The results of the first two years (FY 94 - 95) will be used to determine the future scope of work under the project.

Sockeye Salmon

Summary

RECOVERY OBJECTIVE. Sockeye salmon in affected lakes on Kodiak Island, and in Kenai/Skilak lakes will have recovered when sockeye salmon populations are able to support overwinter survival rates and smolt outmigrations comparable to prespill levels.

The proposals within this section support the recovery objective by monitoring to determine recovery, and by providing stock separation and other information to allow fisheries managers to predict returns and protect injured stocks. Also, efforts to rehabilitate sockeye salmon stocks in Coghill Lake are included in this section.

FINDINGS AND ACCOMPLISHMENTS

To restore Kenai/Skilak sockeye salmon:

- Developed a genetic database of Cook Inlet sockeye runs, and successfully tested its use to provide in-season stock identification tool for Kenai/Skilak sockeye runs.
- Developed a hydroacoustic program to estimate the number of salmon in Upper Cook Inlet during the commercial fishing season.
- Increased knowledge about sockeye production in glacial lakes. This information is useful for predicting adult returns and understanding oil spill and other potential damage.

To restore Kodiak sockeye salmon:

- Smolt counts and other limnological parameters, have provided information for ADF&G to develop a harvest management plan to restore sockeye runs on Red and Akalura Lakes.

To restore Coghill Lake sockeye salmon:

- Completed three years of a five-year fertilization program.

FY 96 AND BEYOND

To restore Kenai/Skilak sockeye salmon:

- Assuming successful FY 95 implementation of the genetic stock identification techniques developed for Cook Inlet sockeye runs, transfer responsibility for continuing the technique to ADF&G fisheries managers, with final Trustee Council funding in FY 96;
- Phase out the limnological program in FY 96.

These projects assume that the return of five-year-old sockeye salmon to Kenai/Skilak system reaches normal levels in 1995. If the returns show a major collapse, the genetic stock identification and limnological investigations may continue.

To restore injured Kodiak sockeye salmon in Red and Akalura Lake runs:

- Continue monitoring smolt counts and other limnological parameters on the Kodiak lakes until smolt counts and parameters appear normal for two consecutive years. This is currently estimated to occur in Red Lake in 1997 with closeout funding in FY 98.

To restore Coghill Lake sockeye salmon:

- Finish fertilizing and monitoring by FY 2000.

COST ESTIMATES AND TIMELINES

	Approved Restoration Projects, FY 92-95:		$5,259,650
FY 96	Kenai/Skilak Genetic Stock Identification	$370,000	
FY 96-98	Sockeye Monitoring (Kenai and Kodiak)	$1,080,000	
FY 96-2000	Coghill Lake Fertilization and Monitoring	$1,000,000	
	Subtotal, FY 96-2000:		$2,450,000
	Total:		$7,709,650

Discussion

KENAI/SKILAK RUN OF SOCKEYE SALMON. Commercial fishing for sockeye salmon in 1989 was curtailed in Upper Cook Inlet. As a result, there were higher than usual returns (overescapement) of spawning fish to the Kenai/Skilak lake systems. The 1989 escapement levels were more than twice the levels thought to be most productive for the system. In addition, 1989 was the third consecutive year of salmon overescapement in the Kenai River system, due to a previous oil spill in 1987 and naturally high overescapement in 1988.

Overly large spawning escapements may result in poor returns in future years by producing more rearing juvenile sockeye than can be supported by the nursery lake's productivity. As a result, juvenile sockeye growth is reduced, mortality increases, larger percentages of juveniles hold over for another year of rearing, and the poor quality of smolts increases marine mortality.

Because sockeye salmon return four and five years after outmigration, 1994 was the first year to assess the accuracy of the monitoring with respect to predicting adults returned from the 1989 brood. The returns were greater than predicted from smolt counts. This indicated that the counts of outmigrating Kenai River smolts from the 1989 brood year were not accurate. The actual return was lower than that predicted from fall fry counts assuming normal overwinter survival. These data indicate an imperfect understanding of the mechanism and amount of the original injury.

Two restoration activities funded by the Trustee Council address the problems of Kenai/Skilak sockeye run: genetic stock identification and hydroacoustic measures, and limnological monitoring.

Genetic Stock Identification and Hydroacoustic Surveys. In 1992, the Trustee Council began a five-year effort to design and test genetic stock identification techniques for Kenai/Skilak stocks in mixed-stock Cook Inlet fisheries. ADF&G scientists assembled a database of genetic information from approximately 30 subpopulations of sockeye salmon among the Kenai/Skilak, Kasilof, and Susitna systems. The technique requires that tissue samples be obtained from the commercial catch during the fishing season. On the basis of those samples, stock composition estimates can be provided within 48 hours.

A companion technique, hydoacoustic surveys of lower Cook Inlet, was also developed as a part of this project. The surveys use sonar surveys to estimate the number of sockeye in lower Cook Inlet before and after commercial fishing openings. Together, the two techniques provide information for the area manager to use to modify fishing areas and openings to protect the injured Kenai/Skilak stocks.

The techniques were successfully tested in 1994 on a limited basis, and will be implemented by ADF&G in 1995. Future Trustee Council funding is expected to be limited to approximately $370,000 for sample analysis and final report preparation in FY 96, assuming that the returns from 1989 (the five-year-old adult returns) reach normal levels. If there is a major collapse in the return, additional funds may be requested.

The successful implementation of this technique, and its transition from a Trustee Council project to a standard ADF&G management tool will be an important restoration achievement for the protection of injured Kenai/Skilak stocks now and in the future. It will also be useful for protection of Kasilof or Susitna River stocks should future events require that protection. The techniques were developed through by the following Trustee Council projects: R 53, R 59, 93012, 93015, 94255 and 95255.

Following a 1994 workshop reviewing of sockeye salmon projects, the Chief Scientist affirmed the value of these projects and recommended that ADF&G should do everything possible to meet the escapement goals of the system.

Limnological Monitoring and Research. In response to the 1989 and previous overescapements, ADF&G has been monitoring and analyzing critical biological attributes in the Kenai/Skilak systems. This program, projects 94258 and 95258, is designed to understand the amount and mechanism of the injury, and to determine the effect of the overescapement on smolt production and subsequent adult returns.

If, in 1995, the returns from 1989 (the five-year-old returns) reach normal levels, given the return-per-spawner history of the Kenai/Skilak system and comparative data from the nearby Kasilof system, the Trustee Council involvement in limnological monitoring and research on the Kenai/Skilak system will end. Under this scenario, final Trustee Council funding for the program will be approximately $500,000 in FY 96 for sample analysis and production of a final report. If 1995 finds a major collapse in the return rate of the Kenai/Skilak five-year-old component, FY 96 will likely continue the research and monitoring program. In this case, the proponents are expected to request approximately $1,000,000 in FY 96 to continue the program and add experimental components deferred in FY 95, and also to request funding in years following FY 96.

KODIAK RUNS OF SOCKEYE SALMON. On the Kodiak Archipelago, the Red, Frazer, Akalura, and Afognak lake systems received significant overescapement in 1989. Subsequent monitoring of the biological parameters and smolt outmigrations in the lakes indicated that little long-term injury resulted for the Frazer and Afognak lake systems.

In Red Lake and Akalura Lake on southern Kodiak Island, zooplankton densities and low smolt numbers demonstrated reduced nursery productivity in the lakes. The Trustee Council approved funds for FY 93 (Project 93030) to examine the feasibility of an array of restoration methods, including backplant stocking and lake fertilization. However, the analysis to date indicates that fertilization is not warranted in Akalura and would probably be of minimal benefit in Red Lake. There was a proposed backplanting of fry by taking eggs from Red Lake if escapements failed to meet 50% of normal figures. The program was not implemented because forecasts indicated escapement levels would be met from wild returns.

Analysis of the 1992 and preliminary 1993 data indicated that the Red Lake zooplankton communities and nutrient levels recovered to the level measured in 1986, before the oil spill. While Red Lake smolt counts appear to remain below optimum levels, the adult returns in 1994 met escapement goals. Therefore, normal agency management actions to assure adequate escapement will be the primary method to assure restoration. Continued smolt counts will be used to forecast future returns and provide assistance to managers in future harvest management decisions. Monitoring will continue until two consecutive years of adequate smolt outmigration indicates recovery.

The Trustee Council-sponsored monitoring program appears to be sufficient to achieve recovery of the Red Lake system. On the basis of current estimates, the second year of adequate smolt outmigration is not expected to occur until 1997, and FY 98 will be the final year of funding (for closeout and final report costs). Of course, 1995 or future smolt counts may change this estimate.

In Akalura Lake, also on southern Kodiak Island, 1990 zooplankton densities and low smolt numbers demonstrated a reduced nursery capacity in the lake. The 1994 return did not meet escapement requirements. As with Red Lake, continued monitoring is expected until two consecutive years of adequate smolt outmigration indicates recovery. It is unknown when that will occur for Akalura Lake.

Following a review of sockeye programs in fall of 1994, one peer reviewer has recommended that future studies consider whether competition by sticklebacks in the Kodiak Island lakes may be slowing the recovery of sockeye. The Kodiak sockeye monitoring projects are 94258 and 95258.

CHIGNIK/BLACK LAKE RUNS OF SOCKEYE SALMON (ALASKA PENINSULA). The Chignik/Black lake system on the Alaska Peninsula also experienced significant overescapement as a result of the curtailed 1989 fishing season. While the Damage Assessment Program undertaken after the spill did not include Chignik and Black lakes, normal ADF&G commercial fishing programs for monitoring adult returns and age composition did not show evidence of injury.

COGHILL LAKE SOCKEYE SALMON. Coghill Lake has historically been a mainstay of the commercial and sport fisheries in Prince William Sound. Returns have declined in recent years from a historical average of 250,000 to less than 10,000 for the last several years.

Very high sockeye salmon escapements in the early 1980s (before the spill) and low zooplankton levels in recent years indicate that overescapement of adult sockeye salmon is a potential cause for the decline. Scientists have not yet ruled out the possibility that the decline is caused by changes in nutrients, or adverse climatic effects unrelated to overescapement. In any case, the current production is dangerously low and could potentially jeopardize the existence of the run.

Sockeye salmon fry rear in Coghill Lake from one to three years. The availability of food for the fry in the lake determines the growth and size of smolts that emigrate to sea. Smolt size, in turn, influences ocean survival and subsequent adult returns. The fry food resources in Coghill Lake are currently very low. As a result, the lake cannot support large numbers of fry, and the smolts are very small.

In 1993, the Trustee Council began a program to fertilize Coghill Lake with a goal to restore the lake's natural productivity, and bring natural returns back to their historical levels. A restored sockeye salmon run would provide important replacement resources for the sport and commercial fisheries of Prince William Sound.

The fertilization program proposed by ADF&G recommends three years of pre-fertilization evaluation, five years of fertilization, and three years of post-fertilization monitoring. Monitoring following the 1993 and 1994 fertilizations indicate a very significant increase in the phytoplankton biomass compared with the pre-fertilization period. 1995 will be the third year of fertilization. However, the lake needs either additional escapement or fry addition to ensure that enough spawners return to the lake. Fry were added in 1994. The Chief Scientist recommends that "without a fishery management plan that reduces or eliminates interception rates of Coghill sockeye...restoration actions taken in Coghill Lake with Trustee Council support may be insufficient."

PAST AUTHORIZATIONS

R 53	Kenai River Sockeye Salmon Restoration	$687,400	
R 59	Genetic Stock ID of Kenai River Sockeye	$310,900	
93012	Genetic Stock ID of Kenai River Sockeye	$294,100	
93015	Kenai River Sockeye Salmon Restoration	$405,200	
93024	Coghill Lake Sockeye Salmon Restoration	$145,050	
94255	Kenai River Sockeye Salmon Restoration	$406,100	
94258	Sockeye Salmon Overescapement	$854,900	
94259	Coghill Lake Sockeye Salmon Restoration	$324,100	
94504	Genetic Stock ID of Kenai River Sockeye	$262,200	
95255	Kenai River Sockeye Salmon Restoration	$502,700	
95258	Sockeye Salmon Overescapement	$793,400	
95259	Coghill Lake Sockeye Salmon Restoration	$273,600	
	Subtotal, FY 92-95:		$5,259,650

FY 96 AND BEYOND

FY 96	\255 Kenai River Sockeye Salmon Restoration	$370,000	307
	\258 Closeout: Kenai Sockeye Salmon Overescapement	$500,000	
	\258 Kodiak Sockeye Salmon Overescapement	$200,000	
	\259 Coghill Lake Sockeye (Fertilization)	$275,000	
	FY 96:		$1,345,000
FY 97	\258 Kodiak Sockeye Salmon Overescapement	$190,000	100
	\259 Coghill Lake Sockeye (Fertilization)	$275,000	
FY 98	\258 Kodiak Sockeye Salmon Overescapement	$190,000	
	\259 Coghill Lake Sockeye (Monitoring)	$150,000	
FY 99	\259 Coghill Lake Sockeye (Monitoring)	$150,000	
FY 2000	\259 Coghill Lake Sockeye (Monitoring)	$150,000	
	Subtotal FY 97-2000:		$1,105,000
	Total:		$7,709,650

If 1995 finds a major collapse in the return of the five-year-old component of the Kenai/Skilak sockeye run, ADF&G will likely request that project 258 be continued rather than closed out in FY 96. If so, ADF&G has indicated that it will request approximately $1,000,000 in FY 96 to continue the program and add experimental components deferred in FY 95. In this case, funds will likely also be requested for years following FY 96.

Cutthroat and Dolly Varden Trout

Summary

RECOVERY OBJECTIVE. Cutthroat and Dolly Varden trout will have recovered when growth rates within oiled areas are comparable to those for unoiled areas.

To date, projects to restore cutthroat and Dolly Varden trout have supplemented populations in Prince William Sound in order to increase the population size and to provide protection against further problems that may affect the species.

FINDINGS AND ACCOMPLISHMENTS

- In 1994 and 1995 the USFS will have completed construction of four projects to provide access to additional rearing habitat for cutthroat or Dolly Varden trout in Prince William Sound. The projects still require monitoring to evaluate project success.

FY 96 AND BEYOND

- Monitor fish habitat projects to determine physical and biological success. The Trustee Council will be asked to fund $2,000 per year for three years for four cutthroat trout projects.

COST ESTIMATES AND TIMELINES

FY 94	94043	Cutthroat & Dolly Habitat Restoration in PWS	(See Note)	
FY 95	95043	Cutthroat & Dolly Habitat Restorat'n in PWS	$134,800	
		Approved Restoration Projects, FY 92-95:		$134,800
FY 96	\043	Cutthroat Habitat Restoration (Monitoring)	$8,000	
FY 97	\043	Cutthroat Habitat Restoration (Monitoring)	$8,000	
FY 98	\043	Cutthroat Habitat Restoration (Monitoring)	$8,000	
		Subtotal FY 96-98:		$24,000
		Total:		$158,800

Note: Costs for Project 94043 were combined with 94139 which provided additional spawning and rearing habitat for salmon. That project is discussed in Pink Salmon Supplementation, page 33.

Discussion

Results of Damage Assessment Study F/S 5, conducted in 1989, 1990, and 1991, indicated that cutthroat and Dolly Varden trout growth rates and adult sizes were less in oiled areas. Further studies have not been conducted to determine whether these possible sublethal effects still exist. However, restoration workshops in the past year have consistently identified the need for these studies to confirm the injury, and determine whether the injury is continuing or if recovery has occurred.

Prince William Sound is the north- and west-most range of cutthroat trout, and the resource does not exist elsewhere in the spill area. The cutthroat stocks known to exist within the Sound are few, rarely number more than 1,000 individuals, and are geographically isolated from each other. Of 143 streams surveyed for spawning salmon in PWS in 1989, only 10 contained anadromous cutthroat trout. Cutthroat trout have a limited home range and do not migrate over great expanses of water. These small populations are vulnerable to exploitation, habitat alterations, and other natural- or human-induced changes.

Smaller harvest could increase the survival of the stocks affected by the spill. In 1989, the ADF&G eliminated sport fishing for these resources in Prince William Sound. The restriction is still in effect. Habitat improvements that increase the population size would make the populations less vulnerable to any further problems that might effect the species. That is, increased population provides a population buffer to assure recovery. For that reason, in 1994 and 1995, the Trustee Council funded a program to increase the rearing and spawning habitat for these species in Prince William Sound (projects 94043 and 95043).

The projects use simple and proven techniques to physically extend the habitat (such as lowering gradients that prevent fish passage, providing log bank shelters to increase rearing habitat, etc.) In these locations, the techniques have little risk to other cutthroat or Dolly Varden populations. Seven locations were evaluated. Three were physically or economically unsuitable and improvements will be complete in the remaining five locations by the end of 1995. All locations are in Prince William Sound:

- Gumboot Creek, Eshamy Bay (Project 043A2);
- Otter Creek and Otter Lake, Knight Island (Project 043A5);
- Shrode Creek, into Shrode Lake, Culross Island (Project 043A7);
- Sockeye Creek and Lake, Knight Island (Project 043B1); and
- Rocky Creek and Bay on Montague Island (Project 043)

The Shrode Creek improvement restores part of an old fish pass constructed by the USFS in the 1960s. It will be monitored by the USFS without further funding from the Trustee Council. Monitoring the success of the habitat improvements in the remaining three creeks is expected to require, for each creek, $2,000 per year for three years of monitoring.

Marine Mammals

Summary

RECOVERY OBJECTIVES. Projects discussed in this section relate to the recovery objectives for **harbor seals** and **killer whales**, which are:

> Recovery will have occurred when harbor seal population trends are stable or increasing.
>
> Killer whales will have recovered when the injured pod grows to at least 36 individuals (1988 level). [Note: Participants at the 1995 Restoration Workshop questioned whether this recovery objective is appropriate because the injured pod may never return to 36 whales. Alternative language may be considered.]

Proposed projects will meet these recovery objectives by monitoring both species, and by conducting research to find out why harbor seals are not recovering.

Although sea otters were also injured, they are discussed under "Nearshore Ecosystem" because they are a key predator in the nearshore ecosystem.

FINDINGS AND ACCOMPLISHMENTS

- Harbor seals were declining in Prince William Sound and northern Gulf of Alaska before the spill for unknown reasons; they were injured by the spill and are not recovering.
- Harbor seal counts during pupping and molting were 16% to 20% lower in 1994 than in 1989.
- The status of the AB pod of killer whales is unclear. In 1993, pod structure appeared to be normal and calves were being born to the pod, suggesting the pod was recovering. In 1994, opportunistic observations suggest that five additional whales may be missing and that pod structure is again fragmented.
- A transient group of killer whales, the AT1 group, feeds on marine mammals, suggesting that killer whale predation could be contributing to the decline of harbor seals.
- In 1994, the Trustee Council contributed to publication of *Marine Mammals and the Exxon Valdez*, which synthesizes data about the effects of the spill on marine mammals, including sea otters, harbor seals, killer whales, and humpback whales.

FY 96 AND BEYOND

- Conduct research into probable factors limiting recovery of harbor seals, including food limitations, particularly as these factors affect the survival of juvenile harbor seals; predation by killer whales; and mortality caused by humans, including incidental take and subsistence harvest. (FY 96–98)

- Monitor the recovery of killer whales and test the hypothesis that predation by transient populations of killer whales feeding on marine mammals in Prince William Sound is having an impact on harbor seals. (FY 96–2001)
- Monitor harbor seal trend count areas during pupping and molting and reevaluate the recovery status of harbor seals and killer whales in FY 98.
- Transition to a community-based harvest monitoring and sampling program by supporting a pilot project proposed for FY 96–97, during which time a long-term operating plan independent of restoration funds would be developed.

COST ESTIMATES AND TIMELINES

	Approved Restoration Projects, FY 92-95:		$1,596,200
FY 96-97	Pilot Project: Community-based Harvest Monitoring and Sampling Program	$70,000	
FY 96-98	Marine Mammal Ecosystem Research	$1,651,800	
	Subtotal FY 96-98:		$1,721,800
	Total:		$3,318,000

Discussion

The spill affected three species of marine mammals — harbor seals, killer whales, and sea otters. This section discusses restoration projects for harbor seals and killer whales. Because sea otters are a key predator in the nearshore ecosystem, they will be discussed under "Nearshore Ecosystem."

RESEARCH. Marine mammal research will focus on why harbor seals are not recovering. Harbor seals were declining in Prince William Sound and the northern Gulf of Alaska before the spill for unknown reasons. The spill exacerbated the decline in oiled areas. Harbor seals do not appear to be recovering. Counts during pupping and molting in 1994 were 16% to 20% lower than counts made shortly after the spill in 1989.

Taking measures to understand and reverse the harbor seal population decline has significant implications for subsistence users and commercial fisheries in Prince William Sound. Harbor seals are an important subsistence resource to residents of Prince William Sound and are less available to hunters now than before the spill. Harbor seals are being considered for listing as depleted under the Marine Mammal Protection Act, which may result in more restrictive measures regarding incidental take of harbor seals by commercial fisheries. By understanding and reversing the harbor seal population decline may increase the availability of harbor seals to subsistence hunters, minimize the impact of subsistence hunting on harbor seal populations, and at least moderate the effect on commercial fisheries of restrictions on incidental take of harbor seals.

In 1994, the Marine Mammal Ecosystem study package was developed to assess the status of harbor seals and try to understand why they are continuing to decline. The study package proposed field work and data analysis for three years, from FY 95 through FY 97, with closeout in FY 98.

The Marine Mammal Ecosystem study package consists of the following four studies, which the Trustee Council funded in FY 95:

95001 Condition and Health of Harbor Seals
95012 Comprehensive Killer Whale Investigation
95064 Monitoring, Habitat Use, and Trophic Interactions of Harbor Seals in PWS
95117 Harbor Seals and EVOS: Blubber and Lipids as Indices of Food Limitation

The four studies in the Marine Mammal Ecosystem study package address the following six working hypotheses for why harbor seals are not recovering:

Hypothesis 1: A viral or bacterial disease agent is causing harbor seals to decline and/or preventing their recovery.

Hypothesis 2: Low pup production is causing harbor seals to decline/fail to recover.

Hypothesis 3: A change in the availability of food/diet since the mid-1970's has resulted in slower growth and/or reduced energy stores in seals, therefore causing harbor seals to decline and/or preventing their recovery.

Hypothesis 4: A change in the availability of food has reduced the survival of subadults, therefore causing harbor seals to decline and/or fail to recover.

Hypothesis 5: Predation by killer whales is preventing an increase in the harbor seal population in Prince William Sound.

Hypothesis 6: Mortality caused by humans (subsistence harvest, incidental take by fisheries, and/or residual effects of the EVOS) is causing harbor seals to decline and/or is preventing their recovery.

Preliminary results of Project 94064 suggest that disease (Hypothesis 1) and reproduction (Hypothesis 2) are unlikely to be limiting the recovery of harbor seals. Adult seals appear healthy, and productivity in Prince William Sound is as high as in other areas where harbor seal populations are growing. However, because these results are preliminary and based on only a few years of data, it is too early to discount disease and reproduction as factors limiting the recovery of harbor seals. The health and productivity of harbor seals can continue to be monitored through FY 97 at minimal cost as part of Project 95064 and Project 95001.

More probable factors limiting recovery are food limitations, particularly as they affect the survival of juvenile harbor seals (Hypotheses 3 and 4); predation by killer whales (Hypothesis 5); and mortality caused by humans, including incidental take and subsistence harvest (Hypothesis 6). Research on harbor seals will focus on these factors.

Food Limitations (Hypotheses 3 and 4). Projects 95001, 95064, and 95117-BAA all contribute to testing hypotheses about food limitations. When research is finished, researchers will have a better idea of what harbor seals are eating, seasonal and annual variation in diet and energy value of prey, where and when seals feed, and site fidelity.

Changes in ecosystems or in prey availability due to natural or human-induced causes can be reflected in the body condition or nutritional status of top-level consumers, such as harbor seals. Project 95001 will investigate nutritional status and body condition of harbor seals in Prince William Sound. Project 95117-BAA will analyze samples collected as part of Project 95001 to produce a complete picture of blubber energy stores available to these seals.

Project 95064 will contribute to testing the food limitation hypothesis by researching habitat use and trophic interactions. Specifically, the project will use satellite-linked time-depth recorders to investigate habitat use, movements, and diving and haulout behavior. Fatty acids in blood and blubber of harbor seals and in prey species will be compared and relative frequencies matched to provide an indication of diet and to elucidate food webs in Prince William Sound.

Two other restoration projects are critical to testing the food limitation hypotheses: Isotope studies (Project 95320-I) and Seabird/Forage Fish studies (Project 95163). Stable isotope analysis can be used to identify major shifts in food sources over the life of an individual animal. Forage fish important for harbor seals include herring, pollock, capelin, squid, eulachon, sandlance, and nearshore species like tomcod. In 1994, researchers noted that one of the largest harbor seal haulouts (Channel Islands) is located near resident herring stocks. These projects are discussed in greater detail in other sections of this document.

Killer Whale Predation (Hypothesis 5). Two projects being undertaken in FY 95 — 95012 and 95064 — will test the killer whale predation hypothesis. A related project, 95121, will also contribute to testing the killer whale hypothesis, but because the focus of Project 95121 is forage fish, it is discussed under "Seabird/Forage Fish and Related Projects."

Projects 95012 and 95121, using complementary techniques, will test the hypothesis that there are two populations of killer whales in Prince William Sound: one that feeds on fish and another that feeds on marine mammals, including harbor seals. The AB pod is a resident pod and is thought to feed mostly on fish; another population, the AT1 group, is transient and thought to feed mostly on marine mammals. Using fatty acid signatures, Project 95121 will provide baseline diet, energy, and trophic level data of fish species that are prey of marine mammals and birds in Prince William Sound.

Project 95064 will model the effects of killer whale predation on harbor seals and evaluate how this factor affects recovery from the spill. By Spring 1996, there is expected to be enough data and analysis to reevaluate the killer whale predation hypothesis and determine if further research is warranted.

Mortality Caused by Humans (Hypothesis 6). Project 95064 will test this hypothesis in two ways: 1) by modelling the effects of subsistence use and incidental take by fisheries on the harbor seal population and evaluating how these factors may affect recovery from the spill, and 2) by conducting genetics analyses to determine whether harbor seals in Prince William Sound constitute a genetically distinct population and to examine regional genetic variation within Prince William Sound. Information about stock identity and stock size will help managers recommend a safe harvest level for harbor seals.

MONITORING. The recovery of harbor seals and killer whales will be monitored as part of two projects in the Marine Mammal Ecosystem study package: Project 95064 and Project 95012.

Harbor Seals. Project 95064 has six components, one of which consists of monitoring harbor seal numbers during pupping and molting periods at 25 trend count sites in Prince William Sound to determine whether or not recovery is occurring. If Project 95064 continues to be funded through FY 98, as proposed, the recovery status of harbor seals will be reevaluated in 1998. The Alaska Department of Fish and Game recommends that harbor seals be monitored again in FY 2000.

Killer Whales. The injured AB pod of killer whales lost animals and travelled in fractured pods for the first few years after the spill. Recently, the AB pod has returned to a more normal structure. However, research conducted in 1994 suggests that five more whales may be missing from AB pod. In addition to testing killer whale predation as a factor limiting recovery of harbor seals (Hypothesis 5), Project 95012 will monitor the recovery of the injured AB pod of killer whales. If Project 95012 continues to be funded, the research component will conclude in FY 98. However, the National Oceanic and Atmospheric Administration recommends that killer whales continue to be monitored every two years until recovery.

Community-based Harvest Monitoring and Sampling Program. Because of the importance of harbor seals to subsistence communities in Prince William Sound, a community-based monitoring program may have merit. Residents of communities that harvest harbor seals are in an excellent position to observe changes in harbor seal populations and condition. A pilot project in FY 96–97 would test the practicality and effectiveness of community-based monitoring and enable participating communities to develop a long-term operating plan independent of restoration funds. Although a project proposal has not yet been developed, a pilot project for FY 96–97 is reflected in this Draft Restoration Program.

NORMAL AGENCY MANAGEMENT. Comparative studies of harbor seals and killer whales are being conducted by the National Oceanic and Atmospheric Administration and the Alaska Department of Fish and Game in Southeast Alaska, an area where harbor seals are not declining, and the northern Gulf of Alaska/Kodiak region. These studies are supported by funds other than the restoration fund. Results of these studies will be integrated with results of the Prince William Sound marine mammal studies sponsored by the Trustee Council.

Projects 95001 and 95117 have similar objectives and methods. For that reason, in the following table they are shown as combined in FY 96 and subsequent years.

FY 92 THROUGH FY 95			
R73	Harbor Seal	$24,700	
93042	Killer Whale Recovery	$113,500	
93046	Habitat Use, Behavior, and Monitoring of Harbor Seals in PWS	$220,900	
94064	Harbor Seal Habitat Use and Monitoring	$270,200	
94092	Killer Whale Recovery Monitoring	$33,700	
94425	Publication of *Marine Mammals and the Exxon Valdez*	$20,000	
95001	Condition and Health of Harbor Seals	$172,800	
95012	Comprehensive Killer Whale Investigation (includes start-up costs, historic data review)	$298,700	
95064	Monitoring, Habitat Use, and Trophic Interactions of Harbor Seals in PWS	$347,100	
95117-BAA	Harbor Seals and EVOS: Blubber and Lipids as Indices of Food Limitation	$94,600	
	Subtotal FY 92-95:		$1,596,200
FY 96 AND BEYOND			
FY 96	\001 Condition and Health of Harbor Seals (including 117/Harbor Seals and EVOS: Blubber and Lipids as Indices of Food Limitation)	$200,000	
FY 96	\012 Comprehensive Killer Whale Investigation	$200,000	
FY 96	\064 Monitoring, Habitat Use, and Trophic Interactions of Harbor Seals in PWS	$338,400	
FY 96	Pilot Project: Community-based Harvest Monitoring and Sampling Program	$35,000	
	Subtotal FY 96:		$773,400
FY 97	\001 Condition and Health of Harbor Seals	$200,000	
FY 97	\012 Comprehensive Killer Whale Investigation	$200,000	
FY 97	\064 Monitoring, Habitat Use, and Trophic Interactions of Harbor Seals in PWS	$338,400	
FY 97	Pilot Project: Community-based Harvest Monitoring and Sampling Program	$35,000	
FY 98	\001 Condition and Health of Harbor Seals	$50,000	
FY 98	\012 Comprehensive Killer Whale Investigation	$50,000	
FY 98	\064 Monitoring, Habitat Use, and Trophic Interactions of Harbor Seals in PWS	$75,000	
	Subtotal FY 97-98:		$948,400
	Total:		$3,318,000

Nearshore Ecosystem Projects

(Sea Otters, river otters, harlequin ducks, pigeon guillemots, black oystercatchers, mussels, clams, other intertidal/subtidal organisms, fate and persistence of oil)

Summary

RECOVERY OBJECTIVES. Projects discussed in this section help accomplish the recovery objectives for nearshore species injured by the oil spill. In general, these species will have recovered when certain parameters return to prespill levels or, in the absence of reliable prespill data, when there are no differences in these parameters between oiled and unoiled areas. The parameters are: for **sea otters**, population abundance, distribution, and health; for **river otters**, habitat use and physiological indices; for **harlequin ducks**, breeding densities and production of young; for **pigeon guillemots**, population abundance; for **black oystercatchers**, population abundance, reproductive success, and growth rates of chicks; for **mussels**, population abundance, productivity, and the absence of oil; for **clams**, population abundance and productivity; and for **other intertidal and subtidal organisms**, community composition, age-class distribution, and population abundance. Proposed projects will meet these recovery objectives by monitoring recovery and conducting research to find out why certain species are not recovering.

Also included in this section are projects that monitor the **fate and persistence of oil** in the spill area. Although clearly not an injured resource itself, oil is the cause of injuries to resources and services. Knowledge of and elimination of residual oil is important for people's perception of recovery. It is also important for the recovery of subsistence, recreation and tourism, and passive use (injured services listed in the Restoration Plan), and for all of the injured resources that rely on the nearshore ecosystem.

FINDINGS AND ACCOMPLISHMENTS

- None of the injured nearshore species has recovered; the recovery status of river otters and clams has not been determined. However, juvenile sea otter survival has increased since the spill (but still remains lower in oiled than nonoiled areas) and sea otter mortality patterns appear to be returning to normal levels.
- Surface oil on most beaches has disappeared over time through microbial degradation, photo-oxidation, mechanical abrasion, and other means. With some exceptions, remaining surface oil has become stable and is showing little sign of degradation.
- Between 1991 and 1993, subsurface oil decreased at many sites throughout Prince William Sound. Sites with little reduction in oil are primarily in "low energy" areas that have little wave action. The worst sites still sheen.
- In FY 94, degradation of surface oil at 14 sites in Prince William Sound was manually accelerated and 12 mussel beds in Prince William Sound were manually cleaned. Effectiveness of the mussel bed cleaning will be evaluated in FY 95.

FY 96 AND BEYOND

- A proposed nearshore vertebrate predator package would examine whether or not sea otters, river otters, harlequin ducks, and pigeon guillemots are recovering, and examine

whether continuing exposure to oil and/or food availability are constraining recovery. Three years of field work are proposed, followed by data analysis and report writing. A programmatic review is scheduled late in 1997 to determine whether modified and/or additional specific field work is needed to answer these questions.

- Conduct abundance monitoring of intertidal communities in Prince William Sound in FY 96 and in Cook Inlet/Kenai Peninsula and the Alaska Peninsula in FY 97.
- Continue to monitor other injured nearshore species until recovery.
- Complete assessment of the location, state, and amount of oil remaining on the Kodiak Archipelago. Monitor residual oil in Prince William Sound periodically until recovery. Determine whether additional cleanup is possible and cost effective.

COST ESTIMATES AND TIMELINES

	Approved Restoration Projects, FY 92-95:	$8,031,698	
FY 95	Nearshore Vertebrate Predator Project	$596,208	
	Subtotal, FY 92-95:		$8,627,906
FY 96	Conclude Eelgrass Habitat Monitoring	$219,100	
FY 96-97	Continue Intertidal/Subtidal Monitoring	$1,150,000	
FY 96-98	Continue Shoreline Assessment/Monitoring	$510,800	
FY 96-99	Nearshore Vertebrate Predator Project	$5,383,785	
FY 96-98	Continue Harlequin Duck Monitoring	$478,900	
FY 96-98	Continue Mussel Bed Monitoring	$512,800	
	Subtotal, FY 96-99:		$8,255,385
	Total:		$16,883,291

Discussion

The nearshore ecosystem includes the community of plants and animals that inhabit the relatively shallow water of shoreline areas. Because of coastal physiography, the nearshore ecosystem served as a repository for much of the oil spilled by the *Exxon Valdez*. Over 1,100 kilometers of coastline were oiled, with over 20 percent of the Prince William Sound shoreline heavily oiled. Additional disturbances of the nearshore ecosystem occurred as heavily oiled beaches were washed during clean-up activities.

Nearshore projects funded by the Trustee Council have focused primarily on research and monitoring aimed at understanding the damages to and the recovery status of individual nearshore species known to have been injured by the oil spill. Projects have focused on intertidal and subtidal organisms (the invertebrates of the nearshore ecosystem, including mussels, clams, algae, barnacles and a host of other benthic organisms), and some of the higher level predators that prey on these invertebrates, specifically sea otters, river otters, harlequin ducks, pigeon guillemots, and black oystercatchers. Studies to date of the abundance, distribution, reproduction, and mortality of these individual resources suggest they are not recovering (the recovery status of river otters and clams has not been determined). The Trustee Council has also funded projects to determine the location, state, and amount of oil remaining along shorelines, on beaches, and within mussel beds in the nearshore area.

Projects proposed for FY 96 and beyond would continue to monitor the recovery of the injured resources, and seek explanations for their failure to recover. Future projects funded by the Trustee Council will focus on ecosystem relationships, will be organized around a few key hypotheses, and will be coordinated through joint planning and data sharing. In addition, monitoring of some individual species to document recovery will continue, as will surveys to determine the extent of residual oil in the ecosystem.

RECOVERY OF NEARSHORE VERTEBRATE PREDATORS.

In 1995, the Trustee Council provided $130,000 to the National Biological Service and NOAA to develop an integrated proposal for the nearshore (Project 95025). That proposal is currently under review by the Chief Scientist, and may be acted on by the Trustee Council later this spring. In brief, the proposal would integrate studies of nearshore vertebrate predators and their prey with measures of individual and population health and hydrocarbon contamination. The proposal is designed to determine whether or not populations are recovering, isolate processes constraining recovery, and identify potential activities to facilitate recovery. Four nearshore vertebrate predator species and their primary prey are proposed for study. The predator species are sea otter, river otter, harlequin duck, and pigeon guillemot. The prey species are mussels, clams, sea urchins, and crabs for sea otters and harlequin ducks, and nearshore benthic fishes for river otters and pigeon guillemots.

Two working hypotheses for why nearshore vertebrate predators are not recovering would be addressed by the proposal.

Hypothesis 1. Initial and/or residual oil in benthic habitats and in or on benthic prey organisms has had a limiting effect on recovery of benthic foraging predators.

Studies conducted since the oil spill suggest continued biochemical effects potentially related to oil toxicity. For example, analyses of blood and serum from sea otters indicated that animals sampled in oiled regions had more inflammatory and/or infectious conditions than animals in unoiled regions, suggesting a diminished immune response. Certain prey species, in particular blue mussels (*Mytilus*) in oiled beds, appear to be a potential source of oil entering the food chain. Studies have documented high concentrations of hydrocarbons in some mussel flesh, byssal thread mats, and underlying sediments in western Prince William Sound.

Hypothesis 2. Prey availability and competition for prey is constraining recovery of sea otters, river otters, pigeon guillemots, and harlequin ducks.

There is strong evidence that population densities of at least some important prey species declined as a result of the oil spill, and have failed to recover in some habitats.

In addition to examining the two hypotheses, the recovery status of the four predator species would be examined through measuring population density and demographic factors (e.g., size

and age distribution, birth rate, survival rate) at both oiled and unoiled sites. Three years of field work are proposed, with a programmatic review at the end of the second year to determine whether a modification of field work is needed in the third year to achieve the project's objectives.

Following is a brief summary of the research to date on the species that would be the focus of study in the nearshore vertebrate predator project, and a description of the research being proposed to address the hypotheses and determine recovery status.

Sea Otters. Up to 4,000 sea otters are estimated to have died as a direct result of oil exposure after the spill. Death occurred from hypothermia; from severe liver, kidney, and lung damage as a result of ingestion of oil; and from emphysema due to inhaling toxic aromatic compounds present during the early period of the spill. By late 1991, results of injury assessment studies suggested that effects from the spill were continuing: the age distributions of dead sea otters were abnormal relative to pre-spill data (more prime-age sea otters were dying), post-weaning survival was low, and there was no increase in abundance in oiled areas. By late 1993, juvenile survival had increased, although it was still lower in oiled compared to unoiled areas, and mortality patterns appeared to be returning to normal. However, surveys of abundance failed to detect increases of sea otters. Results of a new aerial survey methodology implemented in 1992 indicate that densities of sea otters are as much as an order of magnitude lower in areas of Prince William Sound where oiling was most severe and persistent. Blood samples, last collected in 1992, indicate that sea otters living in oiled areas of Prince William Sound have increased levels of blood serum enzymes indicative of liver disorders, and elevated white blood cell counts that may be related to disease from hydrocarbon exposure.

The sea otter component of the nearshore vertebrate predator package would include assessments of abundance, reproduction, mortality, prey selection, bioindicators of exposure to hydrocarbons, and individual health. Measures of population status would be integrated with the abundance and size class distributions of marine invertebrates that compose most of the sea otter diet.

River Otters. Injury assessment studies conducted following the oil spill found that body mass of river otters was significantly lower in oiled, compared with unoiled, areas of Prince William Sound and that the diversity of otter diets was lower in oiled areas than in unoiled areas. Differences in serum chemistry were also identified between oiled and unoiled areas. River otters have not been monitored since FY 92 (Project R103D).

In brief, the river otter component of the proposed nearshore vertebrate predator project would include assessments of abundance, morphometrics, bioindicators of exposure to hydrocarbons, and individual health. Measures of population status would be integrated with the abundance of nearshore benthic fishes that compose most of the river otter diet.

Harlequin Ducks. An estimated 1,000 harlequin ducks died as a direct result of oil exposure following the spill. Data collected to date indicate consistently low numbers of birds during

the breeding season, negligible production of broods (no broods were observed in western Prince William Sound in FY 94), and an apparent decline in post-breeding molting birds. In the early 1970's (the most recent population survey from before the spill), breeding harlequins were distributed throughout Prince William Sound with broods commonly observed in shoreline habitats. Studies indicate that harlequins are reproducing normally in eastern Prince William Sound, and that the population there has remained stable.

Some of the proposed harlequin duck studies would be conducted as part of the nearshore vertebrate predator project — assessments of over-winter survival, abundance relative to prey resources, body composition, and bioindicators of exposure to hydrocarbons. Laboratory studies conducted outside of Alaska indicate that very small amounts of oil can cause reproductive failure in some seabirds. Continued exposure of harlequin ducks to oil may be occurring if they are feeding on contaminated prey, such as mussels from oiled beds.

In addition, monitoring of harlequin ducks for reproductive success and population structure and trends is proposed as a separate monitoring project. In FY 94, criteria and techniques were developed to classify male harlequins by age during the spring and classify all harlequins by sex during the molt (Project 94066). These techniques will allow for better measurement of population structure and trends.

Pigeon Guillemots. An estimated 2,000-3,000 pigeon guillemots were killed as a direct result of the oil spill. The population was in decline before the spill. Studies ongoing since the late 1970's on Naked Island, a major guillemot breeding colony site in Prince William Sound, indicate that the population there is continuing to decline. The diet of guillemot nestlings on Naked Island has changed considerably from the pre-spill period, and growth rates of nestlings have declined.

The pigeon guillemot component of the proposed nearshore vertebrate predator project would include assessments of numbers of breeding pairs, reproductive success, nestling growth rates, fledgling condition indices, bioindicators of exposure to hydrocarbons, and individual health. Indices of reproductive success would be integrated with nestling provisioning rates, taxonomic composition of the diet, and the abundances of these fish taxa in foraging areas near nesting sites. Because pigeon guillemots also feed in pelagic areas, they are also one of the species proposed for study in the Seabird/Forage Fish Interaction project (see Seabird/Forage Fish section).

Mussels. Mussels have been studied for two reasons: they are a likely route of oil exposure to higher level predators, and a possible decline in their abundance or distribution as a result of the oil spill may be affecting the recovery of predator populations.

The original cleanup following the oil spill avoided most mussel beds because the proven techniques available at the time would have further injured the mussels and decreased the food supply available for the other resources that feed on them. In addition, it was thought that winter storms and other natural processes would purge the mussel beds of residual oil. In 1991, exploratory field surveys found that oil trapped in the sediments beneath the byssal

thread mats of mussel beds in protected areas had degraded slowly and retained toxic components. Further studies in FY 92 (Project R013A/B) and FY 93 (Project 93036) indicated the persistence of oil under mussel beds continues, mussels and sediments from oiled beds continue to be the highest hydrocarbon contamination sites in Prince William Sound, and oiled mussels continue to be the most likely route of oil exposure to higher level predators. Mussels are commonly eaten by sea otters in Prince William Sound, particularly juvenile sea otters, and are a prey item for a number of sea duck species.

In FY 94, twelve mussel beds on five sites in Prince William Sound were manually cleaned by replacing the oiled sediments beneath the mussels with clean sediments (Project 94090). In 1995, the success of this restoration effort will be evaluated, untreated mussel beds in Prince William Sound and the Gulf of Alaska will continue to be monitored for natural recovery, and additional sites will be evaluated for future treatment (Project 95090). Although an additional 30 to 35 mussel beds in Prince William Sound and five mussel beds along the Kenai and Alaska Peninsulas are known to be contaminated, it is unlikely that any of these sites will lend themselves to cleaning with current technologies.

Regarding the availability of mussels as prey, injury assessment studies found no overall difference in the abundance of mussels at unoiled beaches compared to oiled beaches, but found that mussels suffered high mortality at sites that received high-pressure hot-water cleanup treatment.

The mussel component of the proposed nearshore vertebrate predator project would compare the abundance and size-distribution of mussels in areas where sea otters have failed to recover (western Prince William Sound) with those in areas where sea otters were not appreciably affected by the oil spill. If large mussels are found to be reduced in abundance, the size-frequency distribution of mussels in western Prince William Sound is similar to that in areas where sea otter abundance has not been reduced, and alternate prey are not available, then it may be postulated that the availability of food is limiting the recovery of sea otters in western Prince William Sound. In addition, continued monitoring of the persistence of oil in mussel beds, in both Prince William Sound and the Gulf of Alaska, is proposed as a separate monitoring project.

Clams. Littleneck clams and butter clams on sheltered beaches were killed by oiling and subsequent high-pressure hot-water cleanup activities. Studies conducted in 1991 found that the hydrocarbon content of clams did not reflect oil spill effects, and that the spill apparently did not change the proportion of clams in sea otters diets. Clams are the predominant prey of sea otters in Prince William Sound.

The clam component of the proposed nearshore vertebrate predator project would compare the abundance, size distribution, and recruitment characteristics of clam populations in areas where sea otters apparently have failed to recover to areas where sea otters were not affected by the oil spill. If clam populations in areas where sea otters are not recovering contain few large individuals and densities are relatively low, it is more likely that food supply may be limiting sea otter recovery.

Sea Urchins. Sea urchins are a favored food of sea otters. Anecdotal observations suggest that sea urchin populations may be increasing in some oiled areas of Prince William Sound. No such aggregations were noted in extensive subtidal surveys conducted in 1989 through 1991. The sea urchin component of the nearshore vertebrate predator project would compare abundance, size distribution, growth rate, and recruitment data at unoiled sites with large numbers of sea otters to oiled sites with few sea otters. If increased urchin abundance in oiled areas is documented, this would provide evidence that the recovery of sea otters is limited by factors other than prey availability.

Nearshore Benthic Fishes. Both river otters and pigeon guillemots feed primarily on small benthic fishes common in the intertidal and shallow subtidal zones of the nearshore ecosystem. There is evidence from other studies in Prince William Sound that the abundance of some prey items in the diets of pigeon guillemots and river otters was reduced by oiling, and that some prey items may be contaminated by oil. For example, gunnels (*Pholidae*) collected in the shallow subtidal from oiled sites in 1993 had evidence of hemosiderosis in their tissues, an indicator of exposure to hydrocarbons. The prey fish component of the proposed nearshore vertebrate predator project would include estimates of abundance at oiled and unoiled sites, and measurement of enzyme levels that indicate continuing exposure to hydrocarbons.

OTHER INTERTIDAL AND SUBTIDAL ORGANISMS

Several studies were initiated following the oil spill to assess the injury sustained by intertidal communities as a result of oiling and subsequent cleanup activities. The Coastal Habitat Injury Assessment project (1989-91) studied the injury and recovery of intertidal communities throughout Prince William Sound, the Cook Inlet-Kenai Peninsula area, and the Kodiak-Alaska Peninsula area. The Herring Bay project, initiated in 1990, is studying what factors are limiting and/or facilitating the recolonization of intertidal invertebrates and algae.

In general, the Coastal Habitat Injury Assessment study found a reduction in intertidal algae, especially the dominant intertidal seaweed *Fucus gardneri*, and an increase in opportunistic algae in the lower intertidal. Intertidal invertebrates most impacted were the limpet, barnacle, mussel (*Mytilus edulis*), two species of littorines, and oligochaetes. Recovery of the intertidal community has varied according to the region, habitat, tidal height, and organism injured.

The Herring Bay studies have sought not only to document injured species, but to elucidate the community interactions important in determining the causes of changes in abundance and to determine factors affecting recovery of injured species. It was discovered that opportunistic algae and barnacles, which increased in abundance after the spill, were responding to increased availability of resources caused by the reduction of dominant organisms such as *Fucus*. Recolonization of *Fucus* on shores denuded by intense cleanup treatments was found to be limited by numerous factors including short dispersal distances, lack of adult plants, and high desiccation stress. *Fucus* serves as habitat for many intertidal

invertebrates and therefore its reduction probably led to the reduction of limpets, certain snails, and possibly whelks. A technique for restoring *Fucus* by attaching erosion control fabric to the rock substrate has been developed and implemented on a limited basis.

In FY 95, funds were provided to close out the Herring Bay studies (Project 95086C). A workshop was held in March 1995, under the direction of the Chief Scientist, to review research findings to date and identify possible future studies. The preliminary recommendation from the workshop is that the 1995 work in Herring Bay should focus on the role of *Fucus* in the upper intertidal zone, and that abundance monitoring under the Coastal Habitat Injury Assessment study should be conducted in Prince William Sound in FY 96 and in Cook Inlet/Kenai Peninsula and the Alaska Peninsula in FY 97. A review of the status and findings of both projects would be conducted before determining whether additional work is warranted in future years.

FATE AND PERSISTENCE OF OIL

Providing information on the location, status, and amount of oil has been a federal and state responsibility since the spill. The information is important both for scientists who are studying the effects of residual oil on injured resources, and for the public's knowledge of recovery.

Surveys to date have found that the oil on most beaches has disappeared over time through microbial degradation, photo-oxidation, mechanical abrasion and other means. With some exceptions, remaining surface oil has become stable and is showing little sign of degradation. Remaining subsurface oil decreased at many sites throughout Prince William Sound between 1991 and 1993. However, there are approximately twelve "low energy" sites (those with little wave action) near the community of Chenega Bay which have experienced little reduction in subsurface oil. The worst sites still sheen.

In FY 95, the Trustee Council funded what is expected to be the last comprehensive assessment of shoreline oil in the Kodiak area (Project 95027). The project will involve local residents in surveying shorelines of local concern, and will also assess shorelines previously found to have significant residual oil (through surveys conducted in 1989, 1990, or 1991) to determine the persistence of oil at these sites. The survey may locate "hot spots" where additional monitoring or restoration is appropriate. Monitoring of more heavily oiled Prince William Sound beaches is proposed to continue until recovery. Monitoring in Prince William Sound occurred annually from 1989 through 1993. The next survey is proposed for FY 98. Future monitoring — probably infrequently — will be scheduled based on the findings in FY 98.

In addition to the shoreline assessments and monitoring, the Trustee Council has also funded some cleanup efforts. In FY 94, 14 beaches in Prince William Sound with hard surface asphalt deposits were manually treated (Project 94266). The asphalt was broken up into very small particles in order to be susceptible to degradation by microbes and photo-oxidation. In FY 95, the Trustee Council funded a review of available clean-up technologies to

determine whether any have the potential for cost-effective, safe treatment of residual oil (Project 95266). If an appropriate technique is identified, it may be tested on one or more oiled beach segments near the community of Chenega Bay. If a test is undertaken, Trustee Council funds will be requested in FY 96 to evaluate the technique's effectiveness. If proven effective, additional funds may be warranted to implement the technique on a larger scale.

ADDITIONAL MONITORING PROJECTS

Mussels. In addition to the abundance and size studies proposed under the nearshore vertebrate predator project, continued monitoring of the persistence of oil in mussel beds, byssal mats, and underlying sediments, in both Prince William Sound and the Gulf of Alaska, is proposed. Monitoring every other year until recovery, with data analysis in the intervening years, is proposed.

Harlequin Ducks. In addition to the over-winter survival studies proposed under the nearshore vertebrate predator project, continued monitoring of harlequin ducks in Prince William Sound for reproductive success and population structure and trends is proposed. A fall survey each year until recovery, and a spring survey at least every third year until recovery, is proposed.

Black Oystercatchers. Within Prince William Sound, an estimated 120 to 150 black oystercatchers, representing 12 to 15 percent of the total estimated population, died as a result of the oil spill. Studies following the oil spill found a reduction in the number of breeding pairs and egg volume. In addition, studies during 1991-92 demonstrated that oystercatcher chicks raised on oiled beaches, despite being delivered a larger biomass of food, grew more slowly than chicks raised on unoiled beaches. Monitoring for recovery of black oystercatchers last occurred in FY 93 (Project 93035).

Eelgrass Habitat. Eelgrass beds are habitat for numerous worms, snails, crabs, amphipods, sea urchins, and sea stars, many of which serve as prey for other nearshore species. Studies conducted immediately following the oil spill found injury to almost all components of the eelgrass habitat. In FY 93, when monitoring last occurred, some segments of the community continued to be significantly diminished. In FY 95, funds were provided to quantify species in the eelgrass habitat, and examine hydrocarbon concentrations in sediments and some dominant demersal fishes (Project 95106). Monitoring one additional year (FY 96) may be proposed.

Prior to FY 95, restoration projects focused on individual injured species. Beginning in FY 95, it is proposed that many of these individual projects be replaced with an integrated nearshore vertebrate predator project.

FY 92 THROUGH FY 95

R71	Document harlequin nesting/brood habitat	$470,500	
R103	Measure oiling, predator use of mussels	$769,323	
R103C	Monitoring black oystercatchers	$121,600	
R103D	Monitoring river otters	$175,900	
93033	Monitoring harlequin ducks	$194,300	
93038	PWS shoreline assessment	$163,860	
✓ 93039	Herring Bay monitoring/restoration	$504,600	
93034	Monitoring pigeon guillemots	$165,850	
93035	Monitoring black oystercatchers	$109,146	
93036	Monitoring/cleaning mussels	$318,600	
93043	Monitoring sea otters	$144,119	
94020	Close-out: monitoring black oystercatchers	$17,300	
94066	Monitoring harlequin ducks	$139,300	
✓ 94086	Herring Bay monitoring	$729,400	
94090	Cleaning mussel beds	$681,100	
94173	Monitoring pigeon guillemots	$201,100	
94246	Close-out: Monitoring sea otters	$207,400	
94266	Shoreline assessment/oil removal	$398,100	
94506	Close-out: pigeon guillemot monitoring	$13,900	
95025-PL	Planning: nearshore vertebrate predators	$130,000	
95025	Nearshore Vertebrate Predator Project *	$0	
95026	Hydrocarbon monitoring/sediment data	$146,900	
95027	Kodiak shoreline assessment	$447,800	
✓ 95086C	Herring Bay monitoring	$742,600	
95090	Monitoring mussels	$438,800	
95106	Monitoring eelgrass habitat	$200,400	
95266	Experimental shoreline oil removal	$172,900	
95427	Harlequin duck breeding survey	$226,900	
	Subtotal FY 92-95:		$8,031,698

* The nearshore vertebrate predator project (Project 95025), is currently under review by the Chief Scientist and may be considered by the Trustee Council in FY 95.

FY 96 AND BEYOND

FY 96	\025	Nearshore vertebrate predator project	$1,644,595
FY 96	\027	Kodiak shoreline assessment	$110,800
FY 96		Intertidal/subtidal monitoring	$450,000
FY 96	\090	Mussel bed monitoring	$216,400

FY 96	\106	Eelgrass habitat monitoring	$219,100	
FY 96	\427	Harlequin duck monitoring	$126,000	
		Subtotal FY 96:		$2,766,895
FY 97	\025	Nearshore vertebrate predator project	$1,644,595	
FY 97	\086	Intertidal/subtidal monitoring	$700,000	
FY 97	\090	Mussel bed cleanup/monitoring	$80,000	
FY 97	\427	Harlequin duck monitoring	$126,000	
FY 98	\025	Nearshore vertebrate predator project	$1,644,595	
FY 98	\027	PWS shoreline assessment	$400,000	
FY 98	\090	Mussel bed cleanup/monitoring	$216,400	
FY 98	\427	Harlequin duck monitoring	$226,900	
FY 99	\025	Nearshore vertebrate predator package	$450,000	
		Subtotal FY 97-99:		$5,488,490
		Total:		$16,287,083

Seabird/Forage Fish & Related Projects

(Bald eagles, common murres, marbled murrelets, pigeon guillemots)

Summary

RECOVERY OBJECTIVES. Projects discussed in this section relate to recovery objectives for four species of birds injured by the spill: **bald eagles, common murres, marbled murrelets, and pigeon guillemots.** In general, these species will have recovered when their populations and productivity return to prespill levels or, in the absence of reliable prespill data, when there are no differences in these parameters between oiled and unoiled areas. Marbled murrelets and pigeon guillemots, which were in decline before the spill, will have recovered when populations are increasing or, at least, stable. (Black oystercatchers and harlequin ducks are addressed under "Nearshore Ecosystem Projects.")

Proposed projects will meet these objectives by monitoring recovery, and conducting research into why certain species are not recovering, focusing on food limitation. When Seabird/Forage Fish research is complete, resource management agencies should have additional tools to manage forage fish populations to aid the recovery of species injured by the spill and other species at risk.

FINDINGS AND ACCOMPLISHMENTS

- None of the populations of injured species has recovered; however, the productivity of common murres is currently within normal ranges.
- In 1994, foxes were eradicated from Simeonof and Chernabura Islands (Alaska Peninsula) to increase populations of native birds, including pigeon guillemots and black oystercatchers.
- In 1994, foraging seabirds were found to be strongly associated with dense schools of forage fish near the surface. As expected, forage fishes were distributed in an irregular pattern.

FY 96 AND BEYOND

- The Seabird/Forage Fish project would examine whether the abundance, composition, and distribution of forage fish are limiting seabird recovery in Prince William Sound. An early draft of the proposed project envisions intensive study for five years (FY 95-99), followed by long-term monitoring.
- Related bird restoration projects would monitor recovery and conduct research into factors other than forage fish that may be limiting recovery, such as predation.

COST ESTIMATES AND TIMELINES

	Approved Restoration Projects, FY 92-95:	$3,455,690	
FY 95	Seabird/Forage Fish Project Request	$1,586,800	
	Subtotal FY 92-95:		$5,042,490
FY 96-99	Seabird/Forage Fish Project	$7,898,700	
FY 96-98	Related Bird Projects	$1,022,000	
	Subtotal FY 96-2002:		$8,920,700
	Total:		$13,963,190

Discussion

This section addresses the long-term restoration needs of four species of birds injured by the spill: **bald eagles, common murres, marbled murrelets, and pigeon guillemots.** Black oystercatchers and harlequin ducks were also injured by the spill, but are addressed under "Nearshore Ecosystem Projects." Pigeon guillemots will be addressed in both the Seabird/Forage Fish project and the Nearshore Vertebrate Predator project because they feed in both nearshore and pelagic areas.

SEABIRD/FORAGE FISH

Populations of several injured fish-eating birds and mammals, including harbor seals, common murres, marbled murrelets, and pigeon guillemots, are not recovering in Prince William Sound. If the spill or other factors disrupted the abundance, composition, and distribution of forage fish, the changes may be constraining recovery of injured resources that feed on them. Efforts to restore injured fish-eating predators may be delayed or unsuccessful without understanding the distribution, abundance, and composition of forage fish.

A pilot forage fish study was funded in FY 94 to assess the abundance, distribution, and composition of forage fish in Prince William Sound. The key forage fish in Prince William Sound are sandlance, pollock, herring, and capelin. The primary objective of Project 94163 was to test techniques and collect data that would aid in designing sampling methods for subsequent years.

In 1994, seabird surveys were conducted simultaneously with hydroacoustic surveys. Foraging seabirds were strongly associated with dense schools of forage fish located near the surface. As expected, forage fish were distributed in an irregular pattern. Analysis of seabird distribution indicated that foraging birds are associated with the shoreline.

Eleven forage fish studies were submitted to the Trustee Council for consideration in FY 95. After a series of review sessions with agency and University of Alaska scientists, the Chief Scientist, and peer reviewers, proposers merged the nine separate proposals into an integrated seabird/forage fish research package. Review of the revised package suggested that additional work was necessary to lay the groundwork for a successful and cost-effective

long-term research effort. The Trustee Council authorized planning and development funds for an integrated seabird/forage fish package (Project 95163-I).

A seabird/forage fish proposal entited "APEX" was submitted to the Trustee Council in March 1995, the Trustee Council may act on the funding request for FY 95 during spring of this year. The proposal has not yet been peer reviewed or endorsed by the Trustee Council. Nonetheless, the proposed hypotheses, which are listed below, give a good idea of current thinking about the trophic interactions of seabirds and the fish they feed on. The project would focus on Prince William Sound initially, but may need to look beyond the Sound to test models explaining fish/seabird interactions. The project proposal envisions intensive study for five years, followed by long-term monitoring.

General Hypothesis. A shift in the trophic structure of Prince William Sound has prevented recovery of injured resources.

Working Hypotheses

Hypothesis 1. The trophic structure of Prince William Sound has changed at the decadal scale.

Hypothesis 2. Planktivory is the factor determining abundance of the preferred forage species of seabirds.

Hypothesis 3. Forage species differ in their spatial responses to oceanographic processes.

Hypothesis 4. Productivity and size of forage species change the energy potentially available for seabirds.

Hypothesis 5. Forage fish characteristics and interactions among seabirds limit availability of seabird prey.

Hypothesis 6. Seabird foraging group size and species composition reflect prey patch size.

Hypothesis 7. Seabird diet composition and amount reflect changes in the relative abundance and distribution of forage fish at relevant scales around colonies.

Hypothesis 8. Changes in seabird reproductive productivity reflect differences in forage fish abundance as measured in adult seabird foraging trips, chick-meal size and chick-provisioning rates.

Hypothesis 9. Seabird reproductive productivity is determined by differences in forage fish nutritional quality.

Hypothesis 10. Seabird species within a community react predictably to different prey bases.

RELATED BIRD PROJECTS

Although the Seabird/Forage Fish project will be the major long-term restoration effort addressing seabirds, other related restoration projects are envisioned. Related projects address other factors, such as reproductive success, that may be limiting recovery. They also monitor recovery of populations. (The Seabird/Forage Fish project does not include monitoring recovery of populations.) Bird restoration projects other than the Seabird/Forage Fish project include the following:

159/Prince William Sound Marine Bird Surveys. Summer and winter seabird surveys were conducted in Prince William Sound in 1990, 1991, and 1993. In 1994, a survey was conducted in winter only. The winter populations of goldeneyes and mergansers were found to have increased faster in unoiled areas than in oiled areas. The winter populations of bald eagles also appear to be increasing faster in unoiled areas than in oiled areas, but the numbers are not consistent enough to be significant. These surveys provide the data to determine when marbled murrelets and pigeon guillemots recover. The U.S. Fish and Wildlife Service proposes to conduct marine bird surveys at three-year intervals.

039/Common Murre Population Monitoring. The recovery objective for common murres states, "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." There are five common murre index colonies in the spill area: the Barren Islands, the Chiswell Islands, the Triplets, Puale Bay, and Ugaiushak Island.

The largest common murre colony in the spill area is on the Barren Islands. The productivity (chicks per nest site) of common murres in the Barren Islands is currently within normal ranges, but population numbers have not recovered to prespill levels. The proposed Seabird/Forage Fish project includes a component to collect and analyze data on productivity and energetics for common murres and other seabird species in the Barren Islands to test hypotheses about shifts in abundance and distribution of forage fish. However, the Seabird/Forage Fish project will not include a mechanism to monitor populations of common murres to ascertain whether populations have recovered to former levels.

Prespill and postspill productivity data are available from the common murre colony at Puale Bay, the second-largest common murre colony in the spill area. Postspill productivity data were collected from 1989 through 1992. In the last two years of monitoring, the productivity at Puale Bay was at the low end of normal ranges. the U.S. Fish and Wildlife Service proposes to monitor productivity of the Puale Bay colony again in FY 96 to confirm recovery.

The population of common murres in the Barren Islands was monitored in 1994 and no trend was found in numbers. Because common murre populations change slowly, population

monitoring projects are proposed for FY 97 and FY 2000. The other four index colonies are smaller than the Barren Islands and their populations were last monitored two to five years ago. Additional population monitoring is tentatively proposed for Puale Bay and Ugaiushak Island in FY 96, FY 99, and FY 2002; for the Triplets Island in FY 97 and FY 2000; and for the Chiswell Islands in FY 98 and FY 2001.

031/Reproductive Success of Murrelets in Prince William Sound. A reproductive study of marbled murrelets, which was proposed in FY 95 as a three-year project, would be continued. The objective of this study is to develop a technique to monitor productivity of murrelets in Prince William Sound.

129/Population Survey of Bald Eagles in Prince William Sound. Bald eagle populations in Prince William Sound will be monitored in FY 95. Their populations are expected to have fully recovered by that time. However, to confirm recovery, bald eagle populations are proposed for monitoring again in FY 2000.

Seabird/Forage Fish & Related Restoration Projects

Prior to FY 95, restoration projects focused on individual injured species. In FY 95, many of these individual projects will be replaced with an ecosystem-based Seabird/Forage Fish project. In addition to the projects described below, recommendations may be forthcoming from the Symposium on Seabird Restoration (Project 95038).

FY 92 THROUGH FY 95

Seabird/Forage Fish Projects

94163	Forage Fish Influence on Injured Species	$606,600	
95121	Fatty Acid Signatures of Forage Fish	$30,000	
95163A	Abundance and Distribution of Forage Fish	$194,800	
95163F	Factors Affecting Pigeon Guillemot Recovery	$55,100	
95163I	Seabird/Forage Fish: Program Management	$150,000	
95163	Seabird/Forage Fish *	$1,586,800	
	Subtotal FY 92-95:		$2,623,300

* Request for FY 95, submitted to the Trustee Council in March 1995. The Seabird/Forage Fish proposal is currently under review by the Chief Scientist and may be considered by the Trustee Council in FY 95.

Related Bird Projects

R11	Murre Restoration Recovery Monitoring	$314,872	
R15	Marbled Murrelet Restoration	$428,529	
93034	Pigeon Guillemot Recovery	**	
93045	Marine Bird and Sea Otter Boat Surveys	$255,647	
93049	Monitor Murre Colony Recovery	$174,642	
94039	Common Murre Population Monitoring	$227,100	
94041	Introduced Predator Removal from Islands	$84,000	
94102	Murrelet Prey and Foraging Habitat in PWS	$231,500	
94159	Marine Bird and Sea Otter Boat Surveys	$145,500	
94173	Pigeon Guillemot Recovery Monitoring	**	
94506	Pigeon Guillemot Recovery	**	
95021	Seasonal Movements by Common Murres	$54,000	
95029	Population Survey of Bald Eagles in PWS	$48,700	
95031	Reproductive Success of Murrelets in PWS	$250,000	
95038	Symposium on Seabird Restoration	$74,400	
95041	Introduced Predator Removal: Followup	$66,500	
95102	Closeout: Murrelet Prey & Foraging Habitat	$63,800	
	Subtotal FY 92-95:		$2,419,190

** See Nearshore Ecosystem section for project costs.

FY 96 THROUGH FY 2002

FY 96	159/Marine Bird and Sea Otter Boat Surveys	$260,000	
FY 96	031/Reproductive Success of Murrelets	$250,000	
FY 96	039-A/Common Murre Population Monitoring (Puale Bay, Ugaiushak Is.)	$100,000	
FY 96	039-B/Common Murre Productivity Monitoring (Puale Bay)	$42,000	
FY 96	163/Seabird/Forage Fish	$1,898,700	
	Subtotal FY 96:		$2,550,700
FY 97	031/Reproductive Success of Murrelets	$250,000	
FY 97	039-A/Common Murre Population Monitoring (Barren Is., Triplet Is.)	$100,000	
FY 97	163/Seabird/Forage Fish	$2,000,000	
FY 98	163-A/Common Murre Population Monitoring (Chiswell Is.)	$20,000	
FY 98	163/Seabird/Forage Fish	$2,000,000	
FY 99	163/Seabird/Forage Fish	$2,000,000	
	Subtotal FY 97-99:		$6,370,000
	Total:		$13,963,190

Subsistence

Summary

RECOVERY OBJECTIVE. Subsistence will have recovered when injured subsistence resources are healthy and productive and exist at pre-spill 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.

The subsistence work group at this year's Restoration Workshop recommended that the recovery objective be revised to include: "Subsistence will have recovered when subsistence users' diet composition and harvest effort exist at pre-spill levels, and when the youth of the community have had the opportunity to learn subsistence skills first hand." The recommendation is currently under review.

Proposed projects will meet the recovery objective by restoring injured resources used for subsistence, testing for food safety, and facilitating involvement of subsistence users in the Trustee Council's restoration process.

FINDINGS AND ACCOMPLISHMENTS

- Levels of subsistence harvest have gradually increased in all of the spill area communities. However, subsistence harvests in Prince William Sound remain below pre-spill levels and, in some areas, the composition of the subsistence harvest has changed significantly. Subsistence users also report that the effort necessary to harvest resources has increased, and they continue to voice concerns about food safety.

FY 96 AND BEYOND

- Facilitate direct involvement of subsistence users in the restoration process throughout the life of the restoration program.
- Continue chinook salmon replacement project through FY 98; evaluate coho salmon replacement project and clam restoration project for further funding.
- Anticipate submittal of additional projects from spill area communities.

COST ESTIMATES AND TIMELINES

	Approved Restoration Projects, FY 92-95:		$1,838,900
FY 96	Complete octopus survey	$103,000	
FY 96	Close-out seal/sea otter coop. assistance	$22,100	
FY 96-98	Continue Chenega Chinook release	$171,800	
FY 96-98	Community participation/communication	$456,000	
	Subtotal FY 96-98:		$752,900
	Total:		$2,591,800

NOTE: Total does not include additional projects that may be submitted as a result of current planning efforts funded by the Trustee Council (Project 95428), or potential future costs of two projects (Project 95127/Tatitlek coho salmon release and 95131/clam enhancement) that will be evaluated for additional funding following the FY 95 field season.

Discussion

Subsistence use of fish and wildlife is a natural resource service that was injured by the oil spill. Data collected by the Alaska Department of Fish and Game indicated that annual per capita subsistence harvests declined dramatically (from nine percent to 77 percent decline compared to pre-spill averages) in ten of the communities in the path of the spill during the first year after the spill.

In subsequent years, subsistence harvests levels have gradually increased in all of the spill area communities, but in Prince William Sound and especially in Chenega Bay, subsistence harvests remain below pre-spill levels. In addition, in some areas there has been a significant change in the composition of subsistence harvests, with increased fish takes and a much reduced marine mammal harvest. Subsistence users also report that the effort necessary to harvest subsistence resources has increased significantly — they must travel farther and spend more time away from the village to harvest resources. Users also continue to voice concerns about the safety of subsistence foods.

In most subsistence communities in the spill area, residents say that maintaining their subsistence culture depends on the uninterrupted use of subsistence resources. They voice concern about the effect the time spent away from subsistence activities has had on the culture, especially for their children.

The policy of the Trustee Council, as stated in the Restoration Plan, is that projects designed to restore or enhance an injured service (1) must have a sufficient relationship to an injured resource, (2) must benefit the same user group that was injured (that is, a project to restore the subsistence service must benefit subsistence users), and (3) should be compatible with the character and public uses of the area. Projects to restore subsistence involve four strategies: restoring injured resources used for subsistence, enhancing and replacing subsistence resources, testing for food safety, and facilitating the participation of and communication with subsistence users in the restoration process.

RESTORING INJURED RESOURCES USED FOR SUBSISTENCE. The most important subsistence strategy is restoration of the resources injured by the oil spill that are important to subsistence. These include clams, harbor seals, Pacific herring, pink salmon, sea otters, and sockeye salmon. In a sense, all projects which help restore or enhance the resources used by subsistence harvesters are subsistence restoration projects.

One project funded by the Trustee Council in FY 95 and not described elsewhere that is of particular interest to subsistence users is a survey of octopus to determine the extent, severity, and cause of the observed decline of these species (Project 95009D). Previous damage assessment work has not focused specifically on octopus. Subsistence users, who traditionally harvest octopus from their dens in the lower intertidal zone, have noted apparent declines in octopus since the oil spill. Researchers will consult with residents of Tatitlek and Chenega Bay to identify historic harvest sites, and beach and SCUBA surveys will be conducted to measure octopus abundance, the number of brooding female octopus, and composition of prey. Chitons will also be surveyed at these sites. Surveys are proposed to

be conducted during two field seasons (FY 95 and FY 96), followed by data analysis and report writing.

ENHANCING AND REPLACING SUBSISTENCE RESOURCES. In FY 95, the Trustee Council funded three projects that would enhance or replace subsistence resources injured by the oil spill.

Clam Enhancement. The Trustee Council funded a pilot project aimed at reestablishing local clam populations in the Nanwalek, Port Graham, and Tatitlek areas (Project 95131). Clams were once a major subsistence food in these communities, but the local clam populations have decreased to very low levels in recent years. There are probably several reasons for the decline in clam populations, including changes in beach configurations from the 1964 earthquake, increasingly heavy sea otter predation, and the *Exxon Valdez* oil spill. Many clam beds were destroyed by direct oiling or oil cleanup. In addition, shellfish have a tendency to accumulate and store the toxic contaminants from non-lethal amounts of oil, which has eroded the confidence of the villagers in the healthfulness of the remaining wild clam populations as a subsistence food.

The main barrier to clam enhancement in Alaska has been the availability of clam seedstock. Recently, the Qutekcak shellfish hatchery in Seward succeeded in bringing small batches of littleneck clams through the most critical stage of development. The hatchery is now working on techniques to produce littleneck clam seedstock. In FY 95, the Trustee Council provided funding to support development of hatchery techniques for producing sufficient quantities of various sized clam seed. If the hatchery succeeds in consistent production of the seedstock, the Trustee Council has expressed interest in providing additional funds for testing and analyzing grow-out methods (e.g., beach seeding, floating racks, biodegradable cones) and for subsequent development of permanent subsistence grow-out sites. Trustee Council funding has been requested through FY 99, as it is expected to take five years to refine production techniques and develop successful growout strategies. A recommendation for funding in FY 96 and beyond will be made following an assessment of the efficacy of the work being done in FY 95.

Chenega Chinook Release Program. To provide replacement salmon, primarily for use of Chenega Bay residents, the Trustee Council funded a remote chinook salmon release program for Crab Bay, adjacent to the village (Project 95272). In FY 94, the Prince William Sound Aquaculture Corporation (PWSAC) barged 50,000 smolts from the Esther Island hatchery to Crab Bay, with the intent of rearing them in net pens for two weeks. The main purpose of the two-week net-pen period was to imprint the salmon to return to the rearing area. However, 200 of the smolts developed a disease and the state pathologist recommended releasing the salmon early — after only four days — to avoid density-induced disease transmission to the other smolts (the disease was not contagious to Chinook wild stocks, as there are none in the area). It is questionable whether the released salmon were imprinted sufficiently to return.

In FY 95, PWSAC plans to release another 50,000 smolts in Crab Bay. The project expects a five percent return. Thus, 2,000 adult chinook are expected to return each year between FY 96 and FY 99. At an average of twenty pounds per returning chinook, the FY 95 release is expected to produce up to 40,000 pounds of salmon, most of which are likely to be taken by Chenega residents. Additional releases of 50,000 smolt per year are envisioned each year through FY 98, a period which covers the long life history of the chinook.

PWSAC is paid for equipment but donates egg-take and hatchery rearing. PWSAC contracts with Chenega Corporation to provide local residents to feed and watch the net-pen smolts.

Tatitlek Coho Salmon Release. The Trustee Council provided funds in FY 95 for environmental and other analysis of a proposed release of 50,000 coho salmon smolt near Tatitlek (Project 95127). The objectives of the release would be similar to those of the Chenega chinook release project: to provide replacement salmon, primarily for subsistence use of Tatitlek residents. The analysis currently underway is intended to determine the risks and benefits of the project. If the results of the analysis are favorable, a proposal to conduct the remote release may be included in the FY 96 work plan. The original proposal envisioned four years of smolt releases, a period which covers the extended life history of the coho.

TESTING FOR FOOD SAFETY. Many subsistence users remain concerned over the possible long term health effects of using resources contaminated by oil. Some subsistence hunters and fishermen have lost confidence in their own abilities to determine if their traditional foods are safe to eat. Some residents have expressed the fear that resources which came into contact with the oil have been altered in some way that cannot be seen or detected in laboratory tests. In addition, abnormalities in some resources have been observed.

In FY 93 and FY 94 (Projects 93017 and 94279), the Trustee Council funded a subsistence food safety testing project. This project continued work conducted in 1989, 1990 and 1991 by the Oil Spill Health Task Force. Under the auspices of the Task Force, samples of subsistence resources were collected from harvest areas used by the impacted communities and were tested for hydrocarbon contamination. Most resources tested, including finfish, deer, and ducks, had very low to background levels of hydrocarbons and were deemed safe to eat. Elevated hydrocarbon levels were found in some marine invertebrates collected from oiled beaches, leading the Task Force to advise subsistence users not to harvest marine invertebrates from obviously contaminated beaches. In 1989 only, elevated hydrocarbon levels were found in the blubber of heavily oiled seals (only in Prince William Sound); follow-up tests in 1993 found no blubber contamination.

Testing continued under the auspices of the Trustee Council in FY 93 and FY 94, with an emphasis on involving subsistence users in the testing process in hopes of increasing their understanding of and trust in the test results. Toward this end, subsistence users assisted in sample collection and toured the testing laboratory. Tests conducted on shellfish, rockfish, sockeye salmon, and harbor seals all found hydrocarbon levels so low as to be within the margin of error for the tests.

In FY 95 (Project 95279), the focus of the project will shift to the study of abnormal resources (animals that appear diseased or malformed) encountered by subsistence users. Community residents will be trained and equipped to collect samples and send them to participating biologists and pathologists for analysis. It is anticipated that this phase of the food safety testing effort will be up and running by the end of FY 95 and can be continued in the future without funding from the Trustee Council, except perhaps a minimal amount to resupply testing kits and ship samples.

FACILITATING THE PARTICIPATION OF AND COMMUNICATION WITH SUBSISTENCE USERS IN THE RESTORATION PROCESS. Subsistence users were deeply affected by the oil spill, and continue to express concern that they are not being adequately informed about restoration efforts directed at the resources they use for food. In addition, subsistence users have knowledge about resources that may assist researchers in achieving restoration objectives. Projects in this section provide information about restoration efforts and the progress of restoration. They also facilitate involvement in the restoration process by subsistence users, and communication between researchers and subsistence users.

Participation of Subsistence Users in the Restoration Process.

- In FY 94 the Trustee Council provided funding for Trustee agencies to hold meetings in spill-area communities to solicit ideas and priorities for restoration of subsistence resources (Project 94428). Several of the projects described in this section were developed through the community meetings. Some of the proposals developed through the community meetings that were not funded by the Trustee Council have been funded through grants awarded by the Alaska Department of Community and Regional Affairs from funds set aside by the Alaska State Legislature from the Exxon criminal settlement. Additional meetings with communities will be held and additional restoration proposals will be developed in FY 95 (Project 95428).

- In FY 94 the Trustee Council provided funding for the Alaska Department of Fish and Game and subsistence users to cooperatively develop recommendations to guide subsistence users who want to voluntarily change their harvesting practices to help harbor seals and sea otters recover (Project 94244). A principal finding of data collected and analyzed in FY 94 is that subsistence harvests did not cause the decline of the harbor seal population. However, whether the continued subsistence harvest is retarding the recovery of harbor seals is still open to question. A major goal in FY 95 (Project 95244) is to identify ways to involve subsistence hunters as full partners in subsistence restoration. Project close-out funds will be requested from the Trustee Council in FY 96, for preparation of a final report. However, the project constitutes a step toward involving subsistence hunters in the resource management process, and may lead to an ongoing exchange of information and consensus building between resource managers and subsistence users with regard to the management of harbor seals.

Communication Between Subsistence Users and the Trustee Council and Researchers. Beginning in FY 95, the Trustee Council is embarking on a major initiative to improve

communications with residents of the spill area, particularly subsistence users. Efforts in FY 95 will include:

- Publication of a newsletter focusing on ongoing research and restoration efforts, and study findings and results (Project 95052).

- Increased interactions between scientists and subsistence users in the spill area, with particular attention to traditional knowledge. Strategies include hiring of community liaisons and community visits by scientists (Project 95052).

- A conference of elders, youth, and other representatives of spill area communities as well as scientists involved in spill area research. Conference goals will focus on the role of traditional knowledge in informing people about the spill's effects on natural resources and subsistence uses, in order to contribute to the recovery of natural resources (Project 95138).

It is anticipated that these projects, or projects with similar goals, will continue throughout the life of the restoration effort.

FY 92 THROUGH FY 95

93016	Chenega Chinook Release	$10,700	
93017	Food Safety Testing	$231,000	
94244	Harbor Seal/Sea Otter Cooperative Effort	$54,500	
94272	Chenega Chinook Release	$57,400	
94279	Food Safety Testing	$379,200	
94428	Community Planning Project	$99,200	
95009D	Octopus/Chiton Survey	$125,000	
95052	Community Participation/Communication	$152,000	
95127	Tatitlek Salmon Release	$5,000	
95131	Clam Restoration (Nanwalek/Port Graham/Tatitlek)	$226,900	
95138	Elders/Youth Conference	$76,400	
95244	Harbor Seal/Sea Otter Cooperative Effort	$93,900	
95272	Chenega Chinook Release	$47,200	
95279	Food Safety Testing	$180,600	
95428	Community Planning Project	$99,900	
	Subtotal FY 92-95:		$1,838,900

FY 96 AND BEYOND

FY 96	\009 Complete octopus survey	$103,000	
FY 96	\052 Continue community participation/communication	$152,000	
FY 96	\244 Close-out harbor seal/sea otter cooperative effort	$22,100	
FY 96	\272Continue Chenega Chinook release	$51,900	
	Subtotal FY 96:		$329,000
FY 97	\052 Continue community participation/communication	$152,000	
FY 97	\272 Continue Chenega Chinook release	$57,100	
FY 98	\052 Continue community participation/communication	$152,000	
FY 98	\272 Continue Chenega Chinook release	$ 62,800	
	Subtotal FY 97-98:		$423,900
	Total:		$2,591,800

NOTE: Total does not include additional projects that may be submitted as a result of current planning efforts funded by the Trustee Council (Project 95428), or potential future costs of two projects (Project 95127/Tatitlek coho salmon release and 95131/clam enhancement) that will be evaluated for additional funding following the FY 95 field season.

Archaeological Resources

Summary

RECOVERY OBJECTIVES. Projects discussed in this section relate to the recovery objective for archaeological resources, which is:

> Archaeological resources are nonrenewable: they cannot recover in the same sense as biological resources. Archaeological resources will be considered recovered when spill-related injury ends; looting and vandalism are at or below pre-spill levels; and the artifacts and scientific data which remain in vandalized sites are preserved. Artifacts and data are typically preserved through excavation or other forms of documentation, or through site stabilization, depending on the nature of the injury and the characteristics of the site.

Participants in the 1995 Restoration Workshop recommended the following addition to the recovery objective for archaeological resources: return artifacts to the spill area when facilities are adequate to receive them. The recommendation is under review.

Proposed projects will meet these objectives by monitoring recovery and preserving artifacts and scientific data from vandalized sites. Local heritage preservation will also be considered.

FINDINGS AND ACCOMPLISHMENTS

- Twenty-four archaeological sites on public land are known to have been adversely affected by direct oiling, cleanup activities, or looting and vandalism linked to the oil spill.
- Most of the vandalism that can be linked to the spill occurred in 1989.
- No new disturbances were detected at sites monitored in 1994.
- Data recovery is underway at two injured archaeological sites in Prince William Sound, SEW–440 and SEW–488; data recovered from these sites will provide significant insights into early occupants of the Sound.
- Construction of the Alutiiq Archaeological Repository in Kodiak was begun in 1994 with financial support from the restoration fund. The facility is expected to open later in 1995.

FY 96 AND BEYOND

- Periodically monitor a small number of "index sites" to gauge whether there is a resurgence in looting and vandalism, and continue hydrocarbon testing (FY 96-2004).
- Complete curation of artifacts from the SEW–440 and SEW–488 sites (FY 96).
- Consider local heritage preservation projects in the context of the Site Protection Plans being developed by the Alaska Department of Natural Resources under 95007-A.

COST ESTIMATES AND TIMELINES

	Approved Restoration Projects, FY 92-95:		$2,719,907
FY 96	Complete Artifact Curation: SEW–440/488	$50,000	
FY 96-2002	Archaeological Site Monitoring	$560,000	
Possible	Data Recovery / Local Heritage Preservation	Unknown	
	Subtotal FY 96-2002:		$610,000
	Total:		$3,329,907

Discussion

Twenty-four archaeological sites on public land are known to have been adversely affected by cleanup activities, or looting and vandalism linked to the oil spill. Conservative projections suggest that approximately 100 additional, but yet unverified, cases of site injury may have occurred. Additional sites on private land may have been injured, but damage assessment studies were limited to public land.

Documented injuries include theft of surface artifacts, masking of subtle clues used to identify and classify sites, violation of ancient burial sites, and destruction of evidence in layered sediments. In addition, vegetation has been disturbed, which has exposed sites to accelerated erosion. The effect of oil on soil chemistry and organic remains may reduce or eliminate the utility of radiocarbon dating in some sites.

Assessments of 14 sites in 1993 suggest that most of the archaeological vandalism that can be linked to the spill occurred in 1989 before adequate constraints were put into place over the activities of oil spill cleanup personnel. Most vandalism took the form of "prospecting" for high yield sites. In 1993, only two of the 14 sites visited showed signs of continued vandalism but it is difficult to prove that this recent vandalism was caused by the *Exxon Valdez* oil spill. Oil was visible in the intertidal zones of two of the 14 sites monitored in 1993, but because oil samples have not yet been analyzed, the *Exxon Valdez* oil spill cannot be confirmed as the source of the oil in these sites.

In 1994, the Alaska Department of Natural Resources monitored seven sites on Shuyak Island and the Outer Kenai Coast (including three at Nuka Island) and found oil but no evidence of new disturbance. The Fish and Wildlife Service monitored six sites on Afognak Island and found no indication of new vandalism. The National Park Service monitored two sites on the land it manages, McArthur Pass in Kenai Fjords National Park and Cape Gull on the Katmai coast, but found no new damage. The U.S. Forest Service is restoring two sites in Prince William Sound: Seward 440 (Eleanor Island) and Seward 488 (Knight Island).

Because looting and vandalism tend to occur in bursts of activity, new disturbances may occur in the future. Therefore, a monitoring program is proposed over a 10-year period. Data recovery efforts and curation of artifacts from the SEW–440 and SEW–488 sites are scheduled to be completed by 1996. In addition, proposals from local sponsors for local

heritage preservation projects will be considered in the context of the Site Protection Plans being developed by the Alaska Department of Natural Resources under Project 95007-A.

MONITORING. The monitoring program for archaeological resources consists of periodic checks on sample ("index") sites to detect further damage from vandalism and looting and hydrocarbon testing of a few sites to gauge the effect of oiling on archaeological deposits.

Index Sites. Prior to FY 95, most injured archaeological sites were monitored every year since the spill. However, because recent surveys show no new disturbance of archaeological sites, injured sites will no longer be monitored every year. In FY 95, a small number of "index sites" will be monitored to gauge whether there is a resurgence in looting and vandalism. Because vandalism triggered by cleanup activities is expected to diminish within 15 years of the spill, Trustee agencies propose to monitor these index sites periodically through the year 2004.

The peer reviewer for archaeological resources advised that the monitoring schedule be tailored to the site: sites already vandalized a great deal should be monitored every year, whereas other index sites may be monitored less frequently, perhaps on a two- or three-year cycle, depending on the level of vandal activity.

Hydrocarbon Testing. The peer reviewer also recommended periodic hydrocarbon testing at one or two sites over the next 10 years to gauge long-term effects of oiling in archaeological deposits. Hydrocarbon testing of archaeological sites enables researchers to detect whether oil is moving from surrounding sediments into archaeological deposits. Introduction of subsurface oil through lateral movement with groundwater could adversely affect the ability to radiocarbon date a site.

SITE STABILIZATION AND DATA RECOVERY. In 1993 and 1994, site stabilization and data recovery was undertaken at 19 injured archaeological sites on state or federal land. In 1995, further restoration is scheduled for two of the injured archaeological sites in Prince William Sound: SEW–440 on Eleanor Island and SEW–488 (Louis Bay Lamp Site) on Knight Island. Both sites were heavily oiled; they were also damaged by high pressure water treatment during the oil spill cleanup. The Louis Bay Lamp Site has yielded dates for human occupation ranging from 600 to 3400 years ago. The importance of the SEW-488 site derives from its age and the information in the site about aboriginal structures and subsistence resources used at that time.

Excavation and site restoration of the SEW–440 and SEW–488 sites will take place during the summer of 1995. Curation of artifacts is scheduled to be completed in 1996. No similar effort is planned for subsequent years, although the monitoring program may reveal the need for further data recovery.

LOCAL HERITAGE PRESERVATION. Residents of the spill area have expressed interest in local heritage preservation projects. The most commonly mentioned projects are artifact repositories in communities within the spill area and site stewardship programs. Site

Protection Plans being developed by the Alaska Department of Natural Resources under Project 95007 will address this issue. Draft Site Protection Plans are expected to be completed in March 1995.

Artifact Repositories. Artifacts uncovered during the spill are stored at the University of Alaska-Fairbanks by agreement with landowners and Exxon. The collection includes 200 to 300 artifacts recovered during the cleanup and additional artifacts recovered during restoration efforts. Residents of the spill area have expressed a strong interest in having artifacts returned to the spill area. The Alutiiq Archaeological Repository in Kodiak, whose construction costs were partly funded by Trustee Council, is the only appropriate artifact storage facility in the spill area. None of the four other museums in the spill area (in Homer, Seward, Valdez, and Cordova) is capable of storing artifacts. Options being evaluated are construction of a new facility, expansion of an existing facility, combination of an artifact repository with a multi-use facility, and development of local storage and display of small collections of artifacts. Considerations include initial cost, long-term maintenance and operation, and ease of access by spill-area residents.

Site Stewardship. Under Project R104A, Trustee agencies prepared a handbook for training local residents to protect cultural resources. Project 94015 proposed site stewardship programs in three communities in the spill area. The project was not approved because of questions about the effectiveness of the approach. Funding for the Alutiiq Archaeological Repository was in part due to the fact that its sponsors committed to an ongoing stewardship program.

FY 92 THROUGH FY 95			
93006	Site Stewardship	$123,272	
93006	Site-Specific Archaeological Restoration	$81,935	
93066	Alutiiq Archaeological Repository	$1,470,000	
94007	Site-Specific Archaeological Restoration	$587,000	
95007A	Index Site Monitoring	$341,700	
95007B	Site Restoration (SEW–440 and SEW–488)	$116,000	
	Subtotal FY 92-95:		$2,719,907
FY 96 AND BEYOND			
FY 96	\007-A Archaeological Site Monitoring	$80,000	
FY 96	\007-B Complete Artifact Curation: SEW–440/488	$50,000	
	Subtotal FY 96:		$130,000
FY 97-2002	\007-A Archaeological Site Monitoring (est. $80,000/yr)	$480,000	
Possible	Future Data Recovery Projects	Unknown	
Possible	Local Heritage Preservation Projects	Unknown	
	Subtotal FY 97-2002:		$480,000
	Total:		$3,329,907

Recreation and Tourism

Summary

RECOVERY OBJECTIVES. This section addresses restoration of recreation and tourism, which "...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."

FINDINGS AND ACCOMPLISHMENTS

- Use of the spill area for recreation and tourism was disrupted by the oil spill. Disruption took the form of diminished wildlife viewing, closures on sport hunting and fishing, residual oil on some beaches with high value for recreation, and displacement of use from oiled areas to non-oiled areas.
- In 1993, Project 93065 produced a prioritized list of 29 proposals for restoring recreation in Prince William Sound.

FY 96 AND BEYOND

- In 1993, the State Legislature appropriated an estimated $10.85 million from the state criminal restitution fund ($50 million payment from Exxon to the State of Alaska that resolved various criminal charges against Exxon) to the Alaska Department of Natural Resources for restoring recreational services. Alaska State Parks administers the program.
- Of the 107 proposals received in response to a public solicitation, Alaska State Parks has recommended that 35 recreation projects receive criminal restitution funds. Recommended projects include trails, interpretive displays, camp sites, cabins, mooring buoys, boat launches, and boardwalks throughout the spill area.
- No additional recreation projects are proposed for use of civil settlement funds in FY 96 and beyond. However, consideration will be given to proposals that are consistent with the *Restoration Plan.*

COST ESTIMATES AND TIMELINES

	Approved Restoration Projects, FY 92-95:	$148,300
FY 95	080/Fleming Spit Recreation Area	Decision pending
FY 96-2002	No projects are proposed for FY 96, but consideration will be given to proposals that are consistent with the *Restoration Plan.*	

Discussion

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 and may decrease the quality of recreational experiences and discourage recreational use of these beaches.

Closures on sport hunting and fishing as a result of the spill also affected use of the spill area for recreation and tourism. Sport fishing resources include salmon, rockfish, Dolly Varden, and cutthroat trout. Harlequin ducks 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 non-oiled areas increased management problems and facility use in non-oiled areas. Some facilities, such as the Green Island cabin and the Fleming Spit camp area, were injured by cleanup workers.

In the years since the spill, there has been a marked increase in visitation to the spill area. However, it is difficult to ascertain the extent to which increased visitation to the spill area is attributable to the spill.

STATE CRIMINAL RESTITUTION FUND. In 1991, the U.S. District Court approved a plea agreement that resolved various criminal charges against Exxon. As part of the criminal plea agreement, Exxon agreed to pay $50 million to the United States and $50 million to the State of Alaska. These payments are called the federal and state criminal restitution funds, respectively.

In 1993, the State Legislature appropriated an estimated $10.85 million from the state criminal restitution fund to the Alaska Department of Natural Resources for restoring recreational services. Alaska State Parks, which administers the appropriation, solicited restoration proposals from the public in late 1994. Eligible projects were evaluated and ranked by committees of private citizens in each region of the spill area. Of the 107 proposals received, Alaska State Parks has recommended 35 projects. Recommended projects include trails, interpretive displays, camp sites, cabins, mooring buoys, boat launches, and boardwalks throughout the spill area. In addition, some funding will be set aside for recreational amenities on land that may be purchased with restoration funds in the future.

GUIDELINES FOR PROPOSALS. Participants in the Restoration Workshop stressed the need to better articulate the legal parameters for potential proposers and reviewers of projects to restore recreation. Recreation is recognized as a service provided by natural resources injured by the spill. The *Restoration Plan* sets forth the following policy for the use of civil settlement funds to restore injured services:

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.

(Exxon Valdez Oil Spill Restoration Plan, p. 14)

The *Restoration Plan* also sets forth the following strategies for restoring recreation:

- Preserve or improve the recreational and tourism values of the spill area. Habitat protection and acquisition are important means of preserving and enhancing the opportunities offered by the spill area. Facilities damaged during cleanup may be repaired if they are still needed. New facilities may restore or enhance opportunities for recreational use of natural resources. Improved or intensified public recreation management may be warranted in some circumstances.
- Remove or reduce residual oil if treatment is cost effective and less harmful than leaving the oil in place.
- Monitor recovery.

(Exxon Valdez Oil Spill Restoration Plan, p. 51)

Recreation Restoration Projects

Project 93065 developed a prioritized list of 29 ideas for restoring recreation in Prince William Sound. Five of the top priority projects were submitted to the Trustee Council for funding in FY 94. None of these projects was approved. Some of the projects may receive financial support from the state criminal restitution fund.

The Trustee Council is considering a proposal for improvements in the Fleming Spit Recreation Area, a popular sportfishing destination in Cordova. Proposed improvements in the Fleming Spit Recreation Area (Project 95080) will be addressed at a Trustee Council meeting in April 1995.

FY 92 THROUGH FY 95

93065	Prince William Sound Recreation Project	$72,000	
94217	Closeout: PWS Recreation Project	$76,300	
95080	Fleming Spit Recreation Area	Decision pending	
	Subtotal FY 92-95:		$148,300

FY 96 AND BEYOND

No projects are proposed for FY 96, but consideration will be given to proposals that are consistent with the *Restoration Plan.*

Reduction of Marine Pollution

Summary

OBJECTIVE. Projects to reduce marine pollution support the recovery of many resources and services injured by the spill. The *Exxon Valdez* Oil Spill Restoration Plan states that "Restoration projects whose primary emphasis is to reduce marine pollution may be considered:

- where the marine pollution is likely to affect the recovery of a part of the injured marine ecosystem, or of injured resources or services; and
- where the project will not duplicate existing agency activities."

FINDINGS AND ACCOMPLISHMENTS. Two projects with the purpose of reducing marine pollution were funded for FY 95. Funding requests beyond FY 96, if any, will be determined after they are completed.

COST ESTIMATES AND TIMELINES

FY 95	95115 Sound Waste Management Plan	$284,500	
	95417 Waste Oil Disposal Facilities	$232,200	
	Subtotal, FY 95:		$516,700
FY 96	Sound Waste Management Plan	$20,000	
	Total (see discussion):		$536,700

Discussion

Waste Oil Disposal Facilities. One method of helping restore the resources and services injured by the oil spill is to protect the injured resources and services from further stress. While protective actions themselves do not accelerate recovery, they help ensure that natural recovery will proceed with a minimum of interference.

Small-boat harbors and communities are a source of chronic marine pollution. Project 95417 will create or aid waste oil recycling and disposal programs in communities in the spill area; thus minimizing the amount of oil reaching marine waters.

Sound Waste Management Plan. Project 95115, the Sound Waste Management Plan, will fund development of a comprehensive plan to identify and remove the major sources of marine pollution and solid waste in Prince William Sound that may be affecting recovery of resources and services injured by the spill. Implementation of the solutions to remove the waste will be funded mainly from sources other than Trustee Council funds. However, some solutions may be appropriate for funding by the Trustee Council in future years. The plan is expected to be finished during FY 96, and it is yet not possible to estimate further Trustee Council funding, if any.

Habitat Protection and Acquisition

Summary

RECOVERY OBJECTIVES. Habitat protection and acquisition is a means of restoring not only injured resources, but also the services (human uses) dependent on those resources. Protecting and acquiring land may minimize further injury to resources and services and allow recovery to continue with the least interference. The following 19 injured resources and services, which are linked to upland and nearshore habitat, may benefit from habitat protection and acquisition: pink salmon, sockeye salmon, cutthroat trout, Dolly Varden, Pacific herring, bald eagle, black oystercatcher, common murre, harbor seal, harlequin duck, intertidal/subtidal biota, marbled murrelet, pigeon guillemot, river otter, sea otter, recreation and tourism, wilderness, cultural resources, and subsistence.

ACCOMPLISHMENTS

- Purchase of 23,800 acres of inholdings within Kachemak Bay State Park.
- Purchase of 41,549 acres on northern Afognak Island (17,166 acres on Seal Bay and 24,383 acres on Tonki Cape), which the Alaska State Legislature dedicated in 1994 as the Afognak Island State Park.
- Purchase of timber rights on 2,052 acres of land in Orca Narrows near Cordova in Prince William Sound.

FY 96 AND BEYOND. Some of the habitat protection actions described below may occur in FY 95. However, these actions are expected to continue through at least FY 96.

- The Trustee Council has made offers to landowners for the protection of additional habitat, including approximately 265,000 acres on Kodiak Island within the Kodiak National Wildlife Refuge, 74,000 acres on Afognak and Shuyak Islands, and approximately 160,000 acres in southwestern and northeastern Prince William Sound.
- The Trustee Council has agreed to continue discussions with landowners in the Kenai area concerning the purchase of approximately 95,000 acres. Much of the acreage under consideration consists of inholdings in Kenai Fjords National Park.
- The Trustee Council will consider protection of several smaller parcels of habitat (under 1,000 acres each).

COST ESTIMATES AND TIMELINES

FY 92-95	Land Purchases	$49,650,000	
FY 92-95	Support Projects	$5,709,700	
	Subtotal FY 92-95:		$55,359,700
FY 96-2002	Future Land Purchases (est.)	$295–$325 million	
FY 96	Support Projects	$500,000	
	Subtotal FY 96–2002:		$296–$326 million
	Total:		$351–$381 million

Discussion

Over the last three years, the Trustee Council located and evaluated lands with the goal of protecting habitat essential to recovery of injured resources and services. Protection of this habitat is designed to prevent additional injury to resources and services while recovery is taking place, as well as provide a long-term safety net for these resources.

PAST HABITAT ACQUISITIONS. The Trustee Council has protected the following three areas that were imminently threatened by clearcut timber harvest.

Kachemak Bay. In 1993, the Trustee Council contributed $7.5 million to the purchase of 23,800 acres of private inholdings within Kachemak Bay State Park on the Kenai Peninsula. The acquisition included a highly productive estuary, several miles of anadromous streams, and intertidal shoreline and upland habitat for bald eagles, marbled murrelets, river otters, and harlequin ducks.

Seal Bay and Tonki Cape (Afognak Island). Also in 1993, the Trustee Council purchased 41,549 acres on northern Afognak Island (17,166 acres on Seal Bay and 24,383 acres on Tonki Cape), which were dedicated in 1994 as the Afognak Island State Park. This mature spruce forest habitat is adjacent to highly productive marine waters and anadromous streams, has excellent characteristics for bald eagle nests, and has value as a wilderness recreation site.

Orca Narrows Subparcel. In January 1995, the Trustee Council purchased from the Eyak Corporation timber rights on 2,052 acres of land in Orca Narrows near Cordova in Prince William Sound. This forest has favorable characteristics for marbled murrelet nesting and contains ten active bald eagle nests. Public support for acquisition of timber rights on this parcel was very strong because of potential impacts to the scenic quality of the area.

FUTURE HABITAT ACQUISITIONS. In November and December 1994, the Trustee Council made offers to landowners for the protection of additional habitat. Offers were made on approximately 265,000 acres on Kodiak Island within the Kodiak National Wildlife Refuge, 74,000 acres on Afognak and Shuyak Islands, and approximately 160,000 acres in southwestern and northeastern Prince William Sound.

In addition, the Trustee Council agreed to continue discussions with landowners in the Kenai area concerning the purchase of approximately 95,000 acres. Much of the acreage under consideration consists of inholdings in Kenai Fjords National Park.

In 1995, the Trustee Council will consider protection of several smaller parcels of habitat (under 1,000 acres each). Nominations have been received on 242 parcels. These parcels have been evaluated for links to resources and services injured by the oil spill and other threshold criteria. Those 117 parcels that were in compliance have been further evaluated, scored, and ranked for benefit to injured resources and services. Fourteen of these parcels were ranked "Moderate" or "High"; the rest were ranked "Low".

The evaluation of most candidate lands is expected to be completed by the end of FY 95. However, an additional $500,000 will be required in FY 96 to support future land purchases. Support activities include negotiating, surveying, appraising, clearing title, conducting hazardous materials surveys, and recording court documents.

Habitat Protection Projects

Listed below are those projects that contributed most directly to the habitat protection and acquisition process. Project costs for FY 94 and FY 95 reflect authorized amounts. Actual expenditures may be significantly less than authorized amounts because of the uncertainties in anticipating in the funding requests for those years the configuration of packages of parcels, and costs for such services as survey and appraisal.

FY 92 THROUGH FY 95

Land Purchases

FY 93	Kachemak Bay Purchase	$7,500,000	
FY 94	Seal Bay Purchase (total commitment)	$38,700,000	
FY 95	Orca Narrows Subparcel	$3,450,000	
	Subtotal FY 92-95:		$49,650,000

Habitat Protection & Acquisition Support

93059	Habitat Identification Workshop	$23,100	
93060	Accelerated Data Acquisition	$43,900	
93064	Imminent Threat Habitat Protection	$89,760	
94110	Habitat Protection: Data Acquisition/Support	$580,700	
94126	Habitat Protection & Acquisition Fund	$2,331,700	
95058	Landowner Assistance Program	$115,800	
95060	Spruce Bark Beetle Impacts	$26,800	
95110	Closeout: Habitat Protection/Acquisition	$144,000	
95126	Habitat Protection and Acquisition Support	$1,111,800	
	Subtotal FY 92-95:		$4,467,560

FY 96 AND BEYOND

FY 96-2002	Future Land Purchases (est.)	$295–$325 million	
FY 96	126 / Habitat Protection and Acquisition Support	$500,000	
	Subtotal FY 96-2002:		$296–$326 million
	Total:		$351–$381 million

On November 2, 1994, the Trustee Council resolved to designate $295 to $325 million as "an initial, flexible placeholder" for habitat protection. Since then, the Trustee Council has paid $3,450,000 for timber rights in the Orca Narrows Subparcel.

Public Information/Science Management/Administration

Discussion

The Public Information/Science Management/Administration projects provide the management and administration necessary to efficiently implement the restoration program developed by the Trustee Council. Funding is required to prepare annual work plans, provide independent scientific review, allow for meaningful public participation, and communicate the progress of the restoration effort to the public.

PUBLIC INFORMATION AND INVOLVEMENT

The civil settlement between Exxon and the state and federal governments requires that the Trustee Council ensure their decision-making process includes "meaningful public participation." Numerous strategies have been adopted to meet this requirement.

Public Advisory Group. The Public Advisory Group (PAG) is a specific requirement in the civil settlement. The first PAG completed its two-year term in October 1994; members for the 1995-96 term have recently been appointed by the Secretary of Interior from nominations made by the Trustee Council. The PAG consists of 17 members, including two ad-hoc members from the State Legislature. The membership represents twelve public interest groups (commercial fishing, subsistence, forest products, tourism, local government, etc.) and includes five members from the public-at-large. The PAG meets at least quarterly and provides input to the Trustee Council on the annual work plan, budgets, and many other aspects of the restoration program.

Public Meetings. Each year the Trustees or their representatives hold public meetings in communities in the spill area to exchange information and solicit public comment. In the last year, 18 public meetings were held on a variety of topics including the annual work plan, the Restoration Plan, the Environmental Impact Statement for the Restoration Plan, and the Alaska SeaLife Center. In addition, all Trustee Council meetings are open to the public and are accessible to communities in the spill region via teleconference. There were 13 Trustee Council meetings in FY 94.

Workshops. Each year the Trustee Council sponsors several technical workshops. A status report and discussion of proposed future restoration efforts occurs at the annual *Exxon Valdez* Oil Spill Restoration Workshop. Other recent workshop topics include seabird restoration, the intertidal/subtidal community, wild salmon stock supplementation, and ecosystem factors affecting pink salmon and herring in Prince William Sound.

Publications. Since 1994 the Trustee Council has published the *Restoration Update*, a bi-monthly newsletter designed to share information on restoration efforts with spill-area residents and other interested parties. The newsletter is distributed to approximately 2,500 people, mostly Alaskans. Also in 1994 the first *Annual Status Report* was published. The

Trustee Council is committed to producing a status report each year to report to the public on the recovery of injured resources and restoration activities underway.

Oil Spill Public Information Center. The OSPIC, established in 1990, serves as the central access point for information and materials generated through the restoration process. The OSPIC collection, which includes Natural Resource Damage Assessment Final Reports, Restoration Project Final Reports, meeting transcripts, work plans, and public comments, is cataloged in the online database of the Western Library Network and is available in Alaska on SLED (Statewide Library Electronic Doorway) and elsewhere via the Internet. Assistance at OSPIC is available on site, by mail, by phone, by fax and by e-mail. OSPIC receives inquiries from students, scientists, government agencies, the media, the business community, and others from literally all over the world. In the past four years, staff librarians have responded to over 11,000 information requests, processed over 1,500 interlibrary loans, and distributed over 20,000 documents.

The level of service to be provided by OSPIC in future years is now being reviewed and will be considered by the Trustee Council in the next year.

Information Management System. To improve public access to information generated through the restoration process, in FY 95 the Trustee Council provided funding to develop a plan and the necessary tools to more efficiently synthesize and disseminate information about the oil spill and the Trustee Council in a "user-friendly" manner. The first step in this process is the development of a bibliography of the studies funded by the Trustee Council, which will then be incorporated into an interactive computer program. The information management system will be coordinated with other data management efforts and be made available to the public through OSPIC.

SCIENTIFIC SUPPORT

Since the oil spill, scientific support has been made available to principal investigators to ensure that damage assessment and restoration studies are based on sound scientific principles. The scientific support, provided through a competitive contract, includes the Chief Scientist and a core group of peer reviewers selected for their specific areas of expertise. In addition, peer reviewers in a wide variety of disciplines provide input as needed on specific projects and issues. This broad based scientific expertise ensures that the Trustee Council fully benefits from the information derived from oil spill related studies and that objective science continues to provide a reliable, responsive framework within which to direct restoration efforts.

PREPARATION OF ANNUAL WORK PLANS AND OTHER ADMINISTRATIVE FUNCTIONS

Administrative Operations/Restoration Work Force. The Trustee Council is staffed by an executive director who oversees a staff that performs the planning, coordination, project oversight, fiscal accountability, and communications functions of the Trustee Council. In addition, each Trustee Council agency has a liaison who assists with work plan development

and generally represents the Trustee Council members in matters related to implementation of the restoration program.

Other. In FY 94 and FY 95, the Trustee Council also provided funds for the Environmental Impact Statement process for the *Exxon Valdez* Oil Spill Restoration Plan. Other such special projects may warrant funding in the future, but none are anticipated at this time.

FY 96 AND BEYOND

It is anticipated that the currently ongoing efforts will continue throughout the life of the restoration effort. The public has voiced concern in the past that too much money is being spent on public information/science management/administration. The goal presented in the Restoration Plan is for administrative costs to average no more than five percent (or roughly $3.5 million) of overall restoration expenditures through FY 2002. As initial planning and implementation activities are completed, the current goal of the Trustee Council is to continue to reduce the amount spent on this component of the work plan, as outlined below.

Projects Addressing Public Information/Science Management/Administration

FY 92 THROUGH FY 95			
FY 92	Administration/Science Management/Public Info.	$5,068,600	
FY 93	Administration/Science Management/Public Info.	$4,135,800	
FY 94	Administration/Science Management/Public Info.	$5,250,000	
94422	Restoration Plan EIS	$343,600	
94507	Symposium Proceedings Publication	$69,000	
95100	Administration/Science Management/Public Info.	$3,666,100	
95089	Information Management System/OSPIC	$ 522,800	
	Subtotal:		$19,055,900
FY 96 AND BEYOND			
FY 96	Administration/Science Management/Public Info.	$3,200,000	
FY 97	Administration/Science Management/Public Info.	$3,200,000	
FY 98	Administration/Science Management/Public Info.	$2,800,000	
FY 99	Administration/Science Management/Public Info.	$2,500,000	
FY 2000	Administration/Science Management/Public Info.	$1,700,000	
FY 2001	Administration/Science Management/Public Info.	$1,500,000	
FY 2002	Administration/Science Management/Public Info.	$1,500,000	
	Subtotal:		$16,400,000
	Total:		$35,455,900

Restoration Reserve

Complete recovery from the *Exxon Valdez* oil spill may not occur for decades. Annual payments by Exxon Corporation to the Restoration Fund end September 2001. To prepare for that time, and to ensure restoration activities needed after that time have a source of funding, the Trustee Council places a portion of the annual payments into the Restoration Reserve.

Exxon's final payment occurs in September 2001 and is expected to fund restoration for FY 2002 which begins October 1, 2001. Restoration activities needed for FY 2003 and beyond are expected to be funded from the Restoration Reserve.

The exact amount placed into the Reserve each year will be determined by the Trustee Council after considering the funding needs for restoration for that year. Twelve million was allocated to the reserve in FY 94 and again in FY 95. It is anticipated that $12 million will be allocated to the Reserve in FY 96 and in each of the seven years remaining through 2001. If so, $108 million plus interest would be available for funding restoration activities after Exxon payments end.

Funds from the Restoration Reserve could potentially benefit any resource or service injured by the oil spill. All expenditures from the Restoration Reserve must be consistent with the requirements of the Court Settlement.

COST AND TIMELINES

Allocations through FY 95:		$24,000,000
FY 96	$12,000,000	
FY 97	$12,000,000	
FY 98	$12,000,000	
FY 99	$12,000,000	
FY 2000	$12,000,000	
FY 2001	$12,000,000	
FY 2002	$12,000,000	
Subtotal, FY 96-2002:		$84,000,000
Total:		$108,000,000

Totals do not include interest.

Research Facilities

Alaska SeaLife Center

Discussion

In November 1994, the Trustee Council conditionally authorized funding of up to $24,956,000 to support construction in Seward of basic marine research infrastructure important to the long term restoration effort. The research facility will be affiliated with the existing University of Alaska School of Fisheries and Ocean Science in Seward. It will provide presently unavailable laboratory capabilities for research and monitoring of marine mammals — primarily harbor seals and sea otters — and marine birds injured by the oil spill. Wet and dry labs will also be available for fish genetics research to examine possible spill-caused heritable genetic damage in salmon and herring, and for live studies of bioenergetics, disease, reproduction, and neurobiology associated with fish and invertebrates in the spill area. The Trustee Council funds will be combined with an additional $12,500,000 appropriated by the Alaska State Legislature from the criminal settlement with Exxon for other development at the site, which will be known as the Alaska SeaLife Center.

Initial construction on the research facility is anticipated to begin during the summer of 1995, with an expected opening date in late 1997.

The Trustees approved funding for the SeaLife Center following an assessment of other coastal research facilities, and a determination that there are no existing facilities in Alaska to adequately address the known and anticipated restoration research needs. In approving the funding, the Trustee Council also adopted a policy regarding future use of the SeaLife Center. The policy states, in part, "Approval of individual laboratory research projects, including the facilities at which they will be located, will be based on the resources required for that project and its cost-effectiveness, including the cost-savings available to the Trustee Council at the SeaLife facility as a result of this capital investment." The Trustee Council's Public Advisory Group formally expressed its support for the research facility at its October 1994 meeting. An Environmental Impact Statement on the facility was completed in October 1994.

Restoration Projects Addressing Research Facilities

FY 92 THROUGH FY 95			
94199	Preparation of EIS on SeaLife Center	$147,000	
95199-CLO	Close-out of EIS process	$46,500	
	If final approval is received, initial payment will be made	$12,500,000	
	Subtotal:		$12,693,500
FY 96 AND BEYOND			
	If final approval is received, final payment will be made	$12,456,000	
	Total:		$25,149,500

APPENDIX A

Instructions for Preparing Detailed Project Descriptions

This appendix provides guidelines for preparing Detailed Project Descriptions (DPDs). For your project to be considered by the Trustee Council, you must provide three written copies and an electronic copy of a Detailed Project Description (DPD) to the address below by **May 1, 1995**. The electronic copy must be on an IBM-compatible disk formatted in WordPerfect 5.1 or WordPerfect 6.0.

Anchorage Restoration Office
645 G Street, Suite 401
Anchorage, AK 99501
Telephone (907) 278-8012
(Toll free within Alaska 1- 800-478-7745; toll free outside Alaska 1-800-283-7745)

Compuserve Address (ATTN B. Loeffler): 73160,1771
Internet Address (ATTN B. Loeffler): 73160.1771@compuserve.com

NO FAXES PLEASE

If you are submitting your project under the Broad Agency Announcement, copies of the DPD must also be sent to:

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

Following scientific and policy review, project descriptions that are considered a high priority for restoration will be published for public review in the *Draft FY 96 Work Plan.* In order to keep the draft work plan to a readable size, only the first few pages of each DPD will be published -- specifically, up to and including the section entitled "FY 96 Budget". **In writing your DPD, please keep in mind that the public is the primary audience for this first part of the DPD. Also, please limit this portion of the DPD to no more than four pages.**

This appendix also provides technical formatting instructions for DPDs. Following these instructions carefully will assist Trustee Council staff in compiling the DPDs into one WordPerfect document for publication as the draft work plan.

Technical Formatting Instructions

- WordPerfect 5.1 or 6.0, IBM compatible
- Font Times Roman 12 point for HP Laser III; no font changes in the body of the document
- All margins .75" (top, bottom, left, right)
- Justify left
- Tabs every .5", and only one tab set in the document (at the beginning)
- No footers or headers
- Page numbers bottom, center
- No hard page ends or conditional page ends
- No Excel spreadsheets or other tables or charts that cannot be imported into WordPerfect
- *Exxon Valdez* in italics; underlined if your software doesn't allow italics without a font change
- Cover letters will be accepted, but will not be published

Bold; large font

Project Title (Descriptive; Limited to 80 Characters if Possible); if the Project is Submitted Under the Broad Agency Announcement, add "Submitted Under the BAA" to the Title

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Project Number: (remember the colon)	(For continuing projects, the last three digits of the 1995 project number preceded by "96"; otherwise, leave blank)
Restoration Category:	(Research, Monitoring, or General Restoration if known; otherwise, leave blank)
Proposer:	(Name of organization, University, Trustee Council agency, or individual)
Lead Trustee Agency:	(If known -- ADEC, ADFG, ADNR, DOI, NOAA, USFS)
Cooperating Agencies:	(If applicable, Trustee agencies other than the lead agency that will receive funding under the project in FY 96)
Duration:	(The number of federal fiscal years -- October 1st to September 30th -- for which funding will be requested from the Trustee Council; count FY 96 as the first year)
Cost FY 96:	(An estimate of the amount of funding that is being requested for expenditure in FY 96; show all dollar amounts in $000,000 format)
Cost FY 97:	(An estimate of the amount of funding, if any, that will be requested for expenditure in FY 97)
Cost FY 98:	(An estimate of the amount of funding, if any, that will be requested for expenditure in FY 98)
Cost FY 99:	(An estimate of the amount of funding, if any, that will be requested for expenditure in FY 99)
Cost FY 00:	(An estimate of the amount of funding, if any, that will be requested for expenditure in FY 00)
Cost FY 01:	(An estimate of the amount of funding, if any, that will be requested for expenditure in FY 01)
Cost FY 02:	(An estimate of the amount of funding, if any, that will be requested for expenditure in FY 02)
Geographic Area:	(Locations where field work will be conducted; e.g., Prince William Sound, Kodiak, Kenai Peninsula)
Injured Resource/Service:	(The resource or service injured by the oil spill that the project is designed to restore; see Table 1 for a list of injured resources and services)

tab over so in alignment

Headings in all caps; bold

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ABSTRACT

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Provide a brief (75 words or less) abstract of the project -- basically, what the project would do. The abstract will be used in preparing summary documents for presentation to the Trustee Council and the public. It may be edited for clarity and readability by Trustee Council staff.

- no footer
- page numbers bottom, center

INTRODUCTION

What is the restoration effort being proposed? If the proposal is a continuation of a previous project, include a description of past efforts (reference projects funded in previous fiscal years and describe what has been done and what has been learned or accomplished to date), a description of the work being undertaken in FY 95, a description of the proposed FY 96 project, and the work planned for the future (each year until project completion). Provide other background necessary to understanding the project.

↓ 2 carriage returns before each heading

NEED FOR THE PROJECT

TAB OVER ↓ 1 carriage return before each sub-heading

A. Statement of Problem > sub-headings in bold

What is the problem? Discuss what injured resource or service the project is designed to restore. (See Table 1 for a list of injured resources and services.) Include a brief summary of the status of the resource/service, and the rate or degree of recovery, if known.

TAB ↓ 1

B. Rationale

Why should the work be done? Discuss how the project would address the problem -- that is, help restoration. Cite the relevant restoration objectives from the *Exxon Valdez Oil Spill Restoration Plan* (all objectives are repeated in Part 2 of this document) and how this proposal would help achieve them. For research projects, describe how the information developed by the proposal will contribute to achieving restoration objectives, giving specific examples whenever possible. For monitoring projects, explain why monitoring needs to be done this year or on the schedule being proposed. For general restoration projects, include what will be produced or accomplished that will contribute to achieving restoration objectives.

TAB ↓ 1

C. Summary of Major Hypotheses and Objectives

What are the project's objectives, both for FY 96 and throughout the life of the project? What specific hypotheses will be tested to meet the objectives? This information should be provided here in summary form, in a style that will be easily understood by the public. A more in-depth presentation of objectives and hypotheses is required under the Project Design section on the following page.

TAB ↓ 1

D. Completion Date

When will the work be completed? That is, during what fiscal year are the project's restoration objectives likely to be met?

COMMUNITY INVOLVEMENT

↓ 1

Is it appropriate to involve residents of spill-area communities in the project? Could the project benefit from local/traditional knowledge? The Trustee Council is committed to informing spill area residents, particularly subsistence users, of restoration efforts and to encouraging the use of traditional knowledge held by subsistence users in the development and implementation of restoration projects. In FY 96, appropriate principal investigators, particularly those whose projects involve work in or near a community or whose restoration objectives are of particular interest to subsistence users, are being asked to assist the Trustee Council in maintaining this commitment.

Toward this end, describe the community involvement efforts, if any, that will be undertaken by the project being proposed. Options for involvement include personal interviews with local residents regarding traditional knowledge, hiring local residents, arranging for local observers, contacting the Trustee Council to coordinate an informational meeting in the community near the project, or submitting an article or photographs for the Trustee Council newsletter. Trustee Council staff will be available to coordinate involvement techniques among projects. If you have questions about this section of the DPD, contact Sandra Schubert at the Anchorage Restoration Office (278-8012) or Rita Miraglia at the Alaska Department of Fish and Game, Division of Subsistence (267-2358).

↓ 2

FY 96 BUDGET

↓ 1

What is the estimated cost of the project in federal FY 96 (October 1, 1995 to September 30, 1996)? Present the costs by (1) personnel, (2) travel, (3) contractual services, (4) commodities, (5) equipment, and (6) general administration. Include any discussion that will help the Trustee Council understand the annual budget or significant changes in the budget from year to year. (Please refer to **Appendix B** for detailed budget instructions..)

Please format your budget like the example below. **Include funds for "Gen. Admin." (General Administration) only if you are a Trustee Council agency. If you are a non-Trustee agency and anticipate indirect costs, please add a line showing that expense.** (Note: If you are a non-Trustee agency, the cost to a designated Trustee agency of managing the project will be added to your budget at a later date.)

↓ 1

* Personnel	125.4
Travel	11.7
Contractual	123.1
Commodities	58.1
Equipment	1.4
indent Subtotal	319.7
Gen. Admin.	27.4
indent Total	347.1 **

→ If using WordPerfect/DOS, use MATH format. With cursor at *, Alt F7, 3 (math), 1 (turn on). With cursor at **, repeat steps (Alt F7, 3, 1) to turn math off.

→ If using WordPerfect/Windows, simply type and tab. Restoration Office staff will convert to a math table before publication.

→ Please, no EXCEL spreadsheets.

F4 in WordPerfect/DOS

F7 in WordPerfect/Windows

To this point in the DPD, the primary audience is the general public and the length is limited to four pages. From this point on, the primary audience is scientific reviewers. There is no page limit, but reasonable brevity is appreciated.

PROJECT DESIGN

A. Objectives

What are the project's objectives, both for FY 96 and throughout the life of the project?

If your project has multiple objectives, please format them like the example below. Use this same format any time you include a list in your DPD.

1. Determine the foraging range of common murres.

2. Measure abundance and distribution of intertidal invertebrates that prey on herring eggs.

3. Determine the age and sex distribution of harlequin ducks.

B. Methods

For research and monitoring projects, what specific hypotheses will be tested to meet the objectives? What data do you need to test these hypotheses? For hypotheses that will be addressed in FY 96, what methods will be used to generate the data? Include a description of scientific methods, field sites, data sets to be generated, and statistical procedures to be used to test hypotheses.

For monitoring projects, what is the statistical justification for the monitoring schedule being proposed? The justification must describe what level of change should be detected to achieve the restoration objective, and the statistical power of the proposed sampling program for detecting such a change.

For general restoration projects, what specific actions will be taken to restore the injured resource/service? For actions that will be undertaken in FY 96, include a description of scientific methods, field sites, data sets to be generated, a description of the statistical procedures that will be used to test performance, and the time frame over which results will be measured.

For projects that would supplement wild fishery stocks, what are the benefits and risks of the proposed supplementation effort? For more information, see the Pink Salmon Supplementation section in Part 2 of this document.

For projects that would involve the lethal collection of birds or mammals, how many individual birds or mammals are proposed for collection? When and at what locations? Include a discussion of the size and health of the population in question. Specify what non-lethal alternatives were considered, and whether required permits have been obtained. If you have questions about this section of the DPD, contact the Anchorage Restoration Office (278-8012).

For all projects, if applicable, discuss alternative methodologies considered, including why the methods proposed are better than alternative methods of achieving the objectives.

C. Contracts and Other Agency Assistance

Which components of the project will be contracted to the private sector? Describe each contract, including what tasks will be contracted and why.

Which components of the project will require contracts for services with other governmental agencies, including universities? Describe each contract, including what tasks will be contracted and why.

D. Location

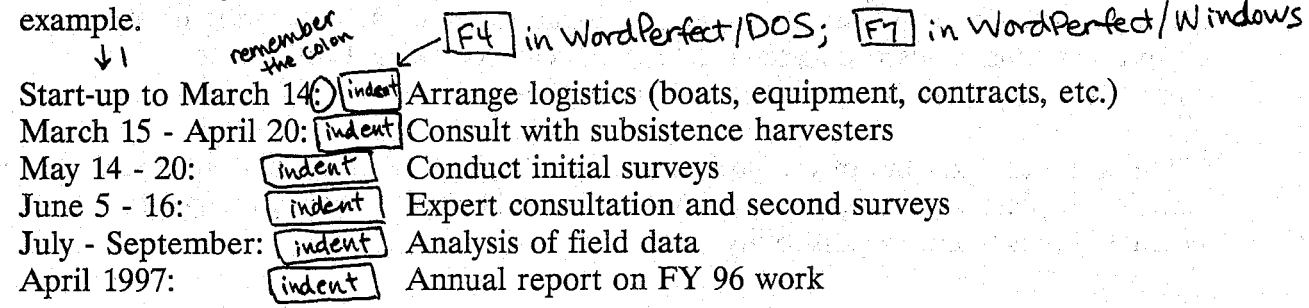
Where will the project be undertaken? Where will the project's benefits be realized? List communities that may be affected by the project.

SCHEDULE

A. Measurable Project Tasks for FY 96

When in FY 96 will major project tasks (for example, NEPA compliance, development of contract proposals and evaluation of bids, community meetings, sample collection, data analysis, report submissions, etc.) be undertaken? Include a schedule of work for FY 96 that specifies the dates for major tasks. This information will be used by Trustee Council staff to track project progress in order to prepare a quarterly project status report for presentation to the Trustees.

Please format your schedule (here, and in parts B and C below) like the following example.



B. Project Milestones and Endpoints

When will each project objective be met? (Objectives listed here should be the objectives already listed under "Project Design", Part A.) Include a schedule, covering the entire life of the project (FY 96 and beyond), of when each project objective will be met. This information will be used by project reviewers during each year's project solicitation and evaluation process to assess whether projects are on track and suitable for continued funding.

C. Project Reports

When will project reports be submitted to the Chief Scientist? In previous years, "final" reports (complete, peer reviewed reports) have been required by April 15 of each year for all projects funded by the Trustee Council, with very few exceptions. Feedback from project leaders and the Chief Scientist has indicated that, for some multi-year projects, this requirement has not been cost effective. This year, in lieu of "final" reports, "annual" reports that describe progress made toward each objective during the year and that include preliminary analyses of completed segments of the project will be accepted if deemed appropriate (on a project-by-project basis) by the Chief Scientist. In this section of the DPD, provide a proposed schedule outlining in which years an "annual" report will be submitted and what completed segments of the project each annual report will address, and in which year the "final" report will be submitted.

Publication of project results in peer-reviewed journals is strongly encouraged by the Trustee Council. With approval of the Chief Scientist, on a project-by-project basis, such publications may satisfy a portion of the Trustees' report requirements. (The Trustee Council has adopted a policy regarding a disclaimer to be used in publishing results of restoration projects. Contact the Anchorage Restoration Office for more information.)

COORDINATION AND INTEGRATION OF RESTORATION EFFORT

What specific opportunities have been explored for coordination and integration with other restoration efforts? Describe with whom coordination has taken or will take place (other Trustee Council funded projects, ongoing agency operations, etc.) and what form the coordination will take (shared field sites, research platforms, sample collection, data management, equipment purchases, etc.). Also describe efforts to obtain matching funds from non-Trustee Council sources, and related or complementary work being undertaken by other entities.

What is the relationship of the project to normal agency management, now and in the future? Explain why the project is not being undertaken as part of an agency's normal management responsibility.

ENVIRONMENTAL COMPLIANCE

↓ 1

What federal, state, and local environmental laws and regulations need to be complied with? What permits need to be obtained? If known, identify which federal agency will conduct NEPA (National Environmental Policy Act) review and whether a categorical exclusion (CE), environmental assessment (EA), or environmental impact statement (EIS) is anticipated to be required.

↓ 2

PERSONNEL

↓ 1

What are the qualifications of each Project Leader and other key personnel who will be implementing the project? Also provide a list of key people who will be working on the project in FY 96 and what their responsibilities will be.

(sign here)
_____

Name of proposed Project Leader (if known, the principal investigator or other individual who will be responsible for actual implementation of the project)
Affiliation
Mailing address
Phone number
Fax number
e-mail address, if known

(sign here)
_____

Name of proposed Project Manager (if known, the individual who represents the lead Trustee agency responsible for project management)
Affiliation
Mailing address
Phone number
Fax number
e-mail address, if known

_____

Date prepared

APPENDIX B

Federal Fiscal Year 1996 Budget Instructions

The budget instructions consist of three parts.

The budgets are due **May 1, 1995** at the same time as the Detailed Project Descriptions. If you are a **Trustee Agency**, all of the forms are required as appropriate for the specific project. If you are a **non-Trustee organization**, the FORM 4A and the FORM 4Bs are required.

Part I. Technical Instructions for Preparing Detailed Project Budgets

A complete set of the budget forms will be provided upon request, along with a diskette. The forms have been created in EXCEL 4.0, but can be saved in EXCEL 5.0. **Please do not alter the forms in any way.** In addition, it is encouraged that a copy of the diskette be made to ensure that a clean set of the forms remains available.

For your project to be considered by the Trustee Council, you must provide three copies of the detailed budget, plus an electronic copy, to the address below by **May 1, 1995**.

Anchorage Restoration Office
645 G Street, Suite 401
Anchorage, AK 99501
Telephone (907) 278-8012
(Toll free within Alaska 1-800-478-7745; toll free outside Alaska 1-800-283-7745)
Compuserve Address (ATTN B. Loeffler): 73160,1771
Internet Address (ATTN B. Loeffler): 73160.1771@compuserve.com

Fiscal Year

The Trustee Council operates on a federal fiscal year (FFY). The FFY 1996 budget is for the period October 1, 1995 through September 30, 1996.

Project Number

Each project is assigned a unique number. For continuing projects, the last three digits of the 1995 project number preceded by "96" should be used. In the case of new projects, you should leave the number blank in the identification field.

Lead Agency Responsibility

The Lead Agency will be assigned as the proposals are received and is responsible for

ensuring that the budget submitted is complete, is consistent with the budget instructions, and corresponds to the detailed project description.

How the Forms Relate

FORM 2A - This summary form is used when multiple Trustee Agencies are cooperating on a project. All of the 3A's roll up to this form.

FORM 3A - This form is used to document individual Trustee Agency costs. All of the 3B budget category forms roll up to this form. Each cooperating agency should have individual FORM 3A's.

FORM 3B DETAIL - This form is used to document the budget categories associated with a given Trustee Agency. The budget category forms roll up to the FORM 3A.

FORM 4A - This form is used by non-Trustee organizations to document costs. All of the 4B budget category forms roll up to this form.

FORM 4B DETAIL - This form is used to document the budget categories associated with non-Trustee organizations. The budget category forms roll up to the FORM 4A.

Document Links

Where appropriate, the budget forms have been linked. This means that as data in one form is updated or changed, it will automatically be updated in the related forms. The only exception is the Proposed FFY 1996 Trustee Agency Total, located on the FORM2A. Since the composition of Trustee Agencies participating on a project is not known at this time, agencies will have to either link the documents themselves or manually input this information.

Automatic Calculations

The forms automatically calculate some of the Proposed FFY 1996 costs. This should result in less error and make budget development easier.

Rules for Names

The following defines the Trustee Agencies and the standard agency names/ abbreviations to be used:

AK Dept. of Environmental Conservation	ADEC
AK Dept. of Fish & Game	ADF&G
AK Dept. of Natural Resources	ADNR
Dept. of Agriculture, Forest Service	USFS
Dept. of Interior	DOI
Dept. of Interior, Fish & Wildlife Service	DOI-FWS
Dept. of Interior, National Biological Service	DOI-NBS
Dept. of Interior, National Park Service	DOI-NPS
National Oceanic & Atmospheric Admin	NOAA

Rules for Numbers

When providing expenditure and position data, please adhere to the following rules:

1. Expenditure information should be stated in thousands of dollars. Therefore, $1,869,489 should be $1,869.5. The only exceptions are the calculation fields located on the various forms.
2. All expenditure numbers should have a decimal point with one digit to the right of the decimal point. The only exceptions are the calculation fields located on the various forms.
3. When the number "5" is the digit to be rounded, the number should be rounded to the higher rather than the lower amount.
4. Position information is reported by full-time equivalent positions (FTE), with months reflected with one digit to the right of the decimal point.

General Administration

Per the Trustee Council's Financial Operating Procedures, the general administration formula includes 15% of each project's personnel costs and up to 7% of the first $250,000 of each project's contractual costs, plus 2% of each project's contractual costs in excess of $250,000. The formula is already built into the FORM 3A. Unless the Trustee Agency wishes to override the calculation, no input is required.

Other Resources

The summary forms 2A, 3A, and 4A's require that other resources which are available for the project be documented. This would include normal agency management activities, now and in the future. Any matching potential must also be shown. An explanation should be provided in the comments field.

National Environmental Policy Act (NEPA)

If known, the cost associated with NEPA compliance must be included for each project and specified in the comments field.

Report Writing

The costs associated with report writing must be included as appropriate. Report writing costs should be reflected in the year the report will be completed, unless a contractor is utilized. When a project and the corresponding project report will be performed under contract, the costs of report writing should be included in the same fiscal year the project is being performed. An explanation should be provided in the comments field. Also specify the type of report expected (annual or final; see DPD instructions for further information on report requirements).

Community Interaction

As appropriate, projects must involve residents of spill-area communities. The cost of community involvement should be budgeted and an explanation provided in the comments field. (See DPD instructions for further information on community involvement.)

Workshops

Costs should be included for each principal investigator to attend the annual workshop to be held in January for approximately one week and one additional workshop for three days. Budget for both workshops to be held in Anchorage. Identify the cost as a program management expense by placing an * in the PM field located on the 3B and 4B budget category forms for personnel and travel.

Forms

Various configurations of the forms are provided on the diskette. Select the configuration which mirrors the individual project.

Text Boxes

The forms contain text boxes for the comments field, the fiscal year, the project identification field, and the form name. To input information, click the box and start typing. The text wraps within the box. The return key should only be used to separate paragraphs. Special steps are required if you are copying or deleting. Please refer to your EXCEL manual for further direction or call the Anchorage Restoration Office.

Additional Explanation Forms

If a project requires more documentation than a form allows, an additional form should be used. Any additional forms must be configured to reflect the form which is being continued. The only exception is the continuation of the comments field. You have the option of duplicating the form or continuing the narrative in another text box.

Saving/Naming

Each budget must be saved/named under the project number. If it is a new project, the file name should be communicated via a cover memorandum.

Part II. Trustee Agency Budget Instructions
FORM 2A PROJECT DETAIL

HOW THE FORM WILL BE USED

This is a summary form which is used when **multiple** Trustee Agencies are cooperating on a project. All of the 3A's roll up to this form. **If only one Trustee Agency is involved, the FORM 2A is not required.**

HOW TO COMPLETE THE FORM

1. *Authorized FFY 1995* - All the information, through the FTE line, is linked to the individual agency forms. No input is required.
2. *Proposed FFY 1996* - All the information, through the FTE line, is linked to the individual agency forms. No input is required.
3. *Other Resources* - All the information is linked to the individual agency forms. No input is required.
4. *Proposed FFY 1996 Trustee Agency Totals* - The total should be reflected for each agency which is cooperating on the project. Agencies must link the FORM 3As.
5. *Long Range Fund Requirements* - All the information is linked to the individual agency forms. No input is required.
6. *Comments* - This space is for comments which clarify the proposed project. At a minimum, address the following:
   - The duties and responsibilities of the individual Trustee Agencies;
   - Explanation of anything that is out of the ordinary.
7. *Project Identification Field* - Enter the project number, title, and lead agency.
8. *Prepared* - Enter the date this budget was prepared.

Budget Category:	Authorized FFY 1995	Proposed FFY 1996	PROPOSED FFY 1996 TRUSTEE AGENCIES TOTALS - 4 - ADEC	ADF&G	ADNR	USFS	DOI	NOAA
			$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Personnel								
Travel								
Contractual								
Commodities								
Equipment	- 1 -	- 2 -	LONG RANGE FUNDING REQUIREMENTS - 5 -					
Subtotal			Estimated FFY 1997	Estimated FFY 1998	Estimated FFY 1999	Estimated FFY 2000	Estimated FFY 2001	Estimated FFY 2002
General Administration								
Project Total			$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Full-time Equivalents (FTE)								
			Dollar amounts are shown in thousands of dollars.					
Other Resources - 3 -	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0

Comments:

- 6 -

1996

Project Number:
Project Title:
Lead Agency:
- 7 -

FORM 2A PROJECT DETAIL

Prepared: - 8 -

FORM 3A AGENCY PROJECT DETAIL

HOW THE FORM WILL BE USED

This form is used to document proposed expenditures associated with each Trustee Agency. The budget category forms (3Bs) roll up to this form.

HOW TO COMPLETE THE FORM

1. *Authorized FFY 1995* - If the project was funded in FFY 1995, input the amount authorized in this field.
2. *Proposed FFY 1996* - All the information, through the FTE line, is linked to the FORM 3B DETAIL. No input is required.
3. *Other Resources* - Enter other resources which may be used for the project through FFY 2002 (definition located on page B3). Use the comments field to explain.
4. *Long Range Fund Requirements* - Agencies are required to document estimated future year costs through FFY 2002 or the end of the project, which ever comes first.
5. *Comments* - At a minimum, address the following;
   - If the project was funded previously under a different number, note the old number;
   - Indicate how much of the total has been requested for NEPA compliance activities, report writing costs, and community interaction activities;
   - An explanation of program management costs;
   - An explanation if the agency is requesting general administration other than that approved by the Financial Operating Procedures;
   - An explanation of other resources;
   - An explanation if the request includes the reauthorization of FFY 1995 funding;
   - An explanation of anything that is out of the ordinary.
6. *Project Identification Field* - Enter the project number, title, and agency.
7. *Prepared* - Enter the date this budget was prepared.

Budget Category:	Authorized FFY 1995	Proposed FFY 1996	LONG RANGE FUNDING REQUIREMENTS - 4 -					
			Estimated FFY 1997	Estimated FFY 1998	Estimated FFY 1999	Estimated FFY 2000	Estimated FFY 2001	Estimated FFY 2002
Personnel								
Travel								
Contractual								
Commodities	- 1 -	- 2 -						
Equipment								
Subtotal								
General Administration								
Project Total								
Full-time Equivalents (FTE)								
	Dollar amounts are shown in thousands of dollars.							
Other Resources - 3 -								

Comments:

EXAMPLE

- 5 -

1996

Prepared: - 7 -

Project Number:
Project Title: - 6 -
Agency: TRUSTEE AGENCY

FORM 3A AGENCY PROJECT DETAIL

FORM 3B Personnel & Travel DETAIL

HOW THE FORM WILL BE USED

This form is used to document personnel and travel requirements of Trustee Agencies. The total proposed for FFY 1996 rolls up to the FORM 3A.

DEFINITIONS

"Personnel" means employees of the Trustee Council Agencies.

"Travel" includes the cost of transportation by public conveyance and per diem. The standard per diem rate of $150 should be used for state agencies and $225 for federal agencies. To the maximum extent possible, travel should be budgeted based on the following.

	No Advance Purchase	Advance Purchase
Anchorage to Juneau	$444 per round trip	$311 per round trip
Anchorage to Fairbanks	$416 per round trip	$128 per round trip
Anchorage to Cordova	$224 per round trip	$70 per round trip
Anchorage to Kodiak	$386 per round trip	$176 per round trip
Anchorage to Homer	$180 per round trip	$84 per round trip
Anchorage to Seattle	$1112 per round trip	$485 per round trip

"Program Management" represents those costs which are not directly associated with the project, but are required to ensure that the project is accomplished consistent with Trustee Council authorization. This is different than "general administration" which is intended to cover indirect costs such as office space, utilities, fixed telephone charges, and all normal agency services.

HOW TO COMPLETE THE FORM

1. *PM* - Those costs associated with program management should be indicated by placement of an *.
2. *Name.* - Enter the first initial and last name of each person expected to be paid under the project. If the name is unknown, enter vacant. For positions GS7/Range 14 or below, enter only the total number of positions requested (names are not required).
3. *Position Description* - Provide a description of the position.
4. *GS/Range/Step* - Enter the appropriate general schedule (GS) and step, or range and step. The field is formatted to accept whole numbers.
5. *Months Budgeted* - Enter the number of months for each position. The field is formatted to accept one decimal point to the right.
6. *Monthly Costs* - Enter the total of salaries and benefits by position. The field is formatted to accept whole numbers.
7. *Overtime* - Enter the overtime and associated benefits estimated for each position. The field is formatted to accept whole numbers.
8. *Proposed FFY 1996 Personnel Costs* - The form is set up to calculate based on the following formula. No input is necessary. The field is formatted to round to thousands.

(months budgeted x monthly costs) + overtime = Proposed FFY 1996 Personnel Costs

9. *Travel Description* - The description should include the destination, the purpose of the trip, and the total number of travelers.
10. *Ticket Price* - Enter the round trip ticket price. The field is formatted to accept whole numbers.
11. *Round Trips* - Enter the number of round trips. The field is formatted to accept whole numbers.
12. *Total Days* - Enter the total number of days in travel status. The field is formatted to accept whole numbers.
13. *Daily Per Diem* - Enter the daily per diem rate. The field is formatted to accept whole numbers.
14. *Proposed FFY 1996 Travel Costs* - The form is set up to calculate based on the following formula. No input is necessary. The field is formatted to round to thousands.

    (Ticket Price x Round Trips) + (Total Days x Daily Per Diem) = Proposed FFY 1996 Travel Costs

15. *Project Identification Field* - Enter the project number, title, and agency.

Personnel Costs:			GS/Range/	Months	Monthly		Proposed
PM	Name	Position Description	Step	Budgeted	Costs	Overtime	FFY 1996
							0.0
							0.0
- 1 -	- 2 -	- 3 -	- 4 -	- 5 -	- 6 -	- 7 -	0.0
							0.0
							0.0
							0.0
							0.0
							0.0
							0.0
							0.0
							0.0
		Subtotal		0.0	0	0	- 8 -
Those costs associated with program management should be indicated by placement of an *.						Personnel Total	$0.0

Travel Costs:		Ticket	Round	Total	Daily	Proposed
PM	Description	Price	Trips	Days	Per Diem	FFY 1996
						0.0
- 1 -	- 9 -	- 10 -	- 11 -	- 12 -	- 13 -	0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						- 14 -
Those costs associated with program management should be indicated by placement of an *.					Travel Total	$0.0

1996	Project Number: Project Title: - 15 - Agency: TRUSTEE AGENCY	FORM 3B Personnel & Travel DETAIL

FORM 3B Contractual & Commodities DETAIL

HOW THE FORM WILL BE USED

This form is used to document contractual and commodities requirements of Trustee Agencies. The total proposed for FFY 1996 rolls up to the FORM 3A.

DEFINITIONS

"Contractual" covers such items as communication, printing, advertising, charters, rental or lease of equipment, repairs and maintenance of equipment, and professional services. "Commodities" are consumable supplies with an estimated life of less than one year and a value of less that $500.

HOW TO COMPLETE THE FORM

1. *Contractual Description* - The description should include what is being purchased and the purpose.
   FORM4A is also required if a significant portion or the entire project will be sub-contracted. Please call the Anchorage Restoration Office if you have questions about this requirement.
2. *Proposed FFY 1996* - Input the proposed FFY 1996 Contractual cost. The field is formatted to round to thousands.
3. *Commodities Description* - The description should include what is being purchased and the purpose.
4. *Proposed FFY 1996* - Input the proposed FFY 1996 Commodities cost. The field is formatted to round to thousands.
5. *Project Identification Field* - Enter the project number, title, and agency.

Contractual Costs:	Proposed
Description	FFY 1996
- 1 -	- 2 -
When a non-trustee organization is used, the form 4A is required. **Contractual Total**	$0.0
Commodities Costs:	Proposed
Description	FFY 1996
- 3 -	- 4 -
Commodities Total	$0.0

1996	Project Number: Project Title: - 5 - Agency: TRUSTEE AGENCY	FORM 3B Contractual & Commodities DETAIL

FORM 3B Equipment DETAIL

HOW THE FORM WILL BE USED

This form is used to document equipment requirements for Trustee Agencies. The total proposed for FFY 1996 rolls up to the FORM 3A. **Equipment previously purchased by the Trustee Council should be utilized to the maximum extent possible.**

DEFINITIONS

"Equipment" is defined as non-consumable items having an estimated life of more than one year and a unit value of greater than $500.

HOW TO COMPLETE THE FORM

1. *Replacement Equipment* - Equipment requested for the replacement of equipment previously purchased by the Trustee Council should be indicated by placement of an R.
2. *New Equipment Description* - Describe the equipment being purchased and the purpose.
3. *Number of Units* - Enter number of units. Field is formatted to accept whole numbers.
4. *Unit Price* - Enter the unit price. The field is formatted to accept whole numbers.
5. *Proposed FFY 1996 New Equipment* - The form is set up to calculate based on the following formula. No input is necessary.
   (Number of Units x Unit Price) = Proposed FFY 1996 New Equipment
6. *Existing Equipment Usage Description* - Describe existing equipment which will be used.
7. *Number of Units* - Enter the number of existing equipment units which will be used. The field is formatted to accept whole numbers.
8. *Inventory Agency* - Enter the agency which currently has the equipment on inventory.
9. *Project Identification Field* - Enter the project number, title, and agency.

New Equipment Purchases: Description		Number of Units	Unit Price	Proposed FFY 1996
- 1 -	- 2 -	- 3 -	- 4 -	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 - 5 -
Those purchases associated with replacement equipment should be indicated by placement of an R.			New Equipment Total	$0.0

Existing Equipment Usage: Description	Number of Units	Inventory Agency
- 6 -	- 7 -	- 8 -

1996	Project Number: Project Title: - 9 - Agency: TRUSTEE AGENCY	FORM 3B Equipment DETAIL

Part III. Non-Trustee Organization Budget Instructions

A non-Trustee organization is any state or federal agency not listed on page two under "Rules for Names" and any private or non-profit organizations. The University of Alaska is considered a non-Trustee organization. Non-Trustee organizations must submit the FORM 4A and the budget category FORM 4Bs.

For your project to be considered by the Trustee Council, you must provide three copies of the budgets, plus an electronic copy, to the address below by **May 1, 1995.**

Anchorage Restoration Office
645 G Street, Suite 401
Anchorage, AK. 99501
Telephone (907) 278-8012
(Toll free within Alaska 1-800-478-7745; toll free outside Alaska 1-800-283-7745)
Compuserve Address (ATTN B. Loeffler): 73160,1771
Internet Address (ATTN B. Loeffler): 73160.1771@compuserve.com

If you are submitting your project under the Broad Agency Announcement, a copy of your detailed budget forms must also be submitted to:

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

Please Note: A Lead Trustee Agency will be assigned to each proposal received. You will be notified of whom the Lead Trustee Agency is on your project. From that point forward, the Lead Trustee Agency will communicate with you if any further information is needed concerning the budget.

FORM 4A NON-TRUSTEE DETAIL

HOW THE FORM WILL BE USED

This form is to be used to document line-item costs by a non-Trustee organization. The budget category forms (4Bs) roll up to this form.

HOW TO COMPLETE THE FORM

1. *Authorized FFY 1995* - Input the non-Trustee related expenses that were authorized in FFY 1995.
2. *Proposed FFY 1996* - All the information, through the FTE line, is linked to the FORM 4B DETAIL. No input is required.
3. *Indirect* - Input the proposed indirect project costs. Explain in the comments field.
4. *Other Resources* - Enter other resources which may be used for the project through FFY 2002 (definition located on page B3). An explanation must be included in the comments field.
5. *Long Range Fund Requirements* - Input expenses that are anticipated through FFY 2002 or the end of the project, whichever comes first.
6. *Comments* - At a minimum, include the following:
   - An explanation of the indirect costs;
   - An explanation of other resources;
   - How much of the total is for report writing and community interaction activities;
   - An explanation of anything that is out of the ordinary.
7. *Project Identification Field* - Enter the project number and title. If you are submitting your proposal under the BAA, enter your organization's name. If not, leave the name field blank.
8. *Prepared* - Enter the date this budget was prepared.

Budget Category:	Authorized FFY 1995	Proposed FFY 1996	LONG RANGE FUNDING REQUIREMENTS - 5 -					
			Estimated FFY 1997	Estimated FFY 1998	Estimated FFY 1999	Estimated FFY 2000	Estimated FFY 2001	Estimated FFY 2002
Personnel								
Travel								
Contractual	- 1 -	- 2 -						
Commodities								
Equipment								
Subtotal								
Indirect		- 3 -						
Project Total								
Full-time Equivalents (FTE)								
	Dollar amounts are shown in thousands of dollars.							
Other Resources - 4 -								

Comments:
EXAMPLE

- 6 -

1996

Prepared: - 8 -

Project Number:
Project Title: - 7 -
Name: NON-TRUSTEE OR BAA PROPOSER

FORM 4A
Non-Trustee
DETAIL

FORM 4B Personnel & Travel DETAIL

HOW THE FORM WILL BE USED

This form is used to document personnel and travel requirements of non-Trustee organizations. The total proposed for FFY 1996 rolls up to the FORM 4A.

DEFINITIONS

"Personnel" means employees of the non-Trustee organization, and includes tuition for students.

"Travel" includes the cost of transportation by public conveyance and per diem. To the maximum extent possible, travel should be budgeted based on the following.

	No Advance Purchase	Advance Purchase
Anchorage to Juneau	$444 per round trip	$311 per round trip
Anchorage to Fairbanks	$416 per round trip	$128 per round trip
Anchorage to Cordova	$224 per round trip	$70 per round trip
Anchorage to Kodiak	$386 per round trip	$176 per round trip
Anchorage to Homer	$180 per round trip	$84 per round trip
Anchorage to Seattle	$1112 per round trip	$485 per round trip

HOW TO COMPLETE THE FORM

1. *Name.* - Enter the first initial and last name of each person expected to be paid under this project. If the name is unknown, enter vacant. Names are not required for students; enter only the total number of student positions requested.

2. *Position Description* - A description of the position should be provided in this field.

3. *Months Budgeted* - Enter the number of months for each position. The field is formatted to accept one decimal point to the right.

4. *Monthly Costs* - Enter the total salaries and benefits by position. The field is formatted to accept whole numbers.

5. *Overtime* - Enter the overtime and associated benefits estimated for each position. The field is formatted to accept whole numbers.

6. *Proposed FFY 1996 Personnel Costs* - The form is set up to calculate based on the following formula. No input is necessary. The field is formatted to round to thousands.

   (months budgeted x monthly costs) + overtime = Proposed FFY 1996 Personnel Costs

7. *Travel Description* - The description should include the destination, the purpose, and the total number of travelers.

8. *Ticket Price* - Enter round trip ticket price. Field is formatted to accept whole numbers.

9. *Round Trips* - Enter the number of round trips. The field is formatted to accept whole numbers.

10. *Total Days* - Enter the total number of days in travel status. The field is formatted to accept whole numbers.

11. *Daily Per Diem* - Enter the daily per diem rate. The field is formatted to accept whole numbers.

12. *Proposed FFY 1996 Travel Costs* - The form is set up to calculate based on the following formula. No input is necessary. The field is formatted to round to thousands.

(Ticket Price x Round Trips) + (Total Days x Daily Per Diem) = Proposed FFY 1996 Travel Costs

13. *Project Identification Field* - Enter the project number and title. If you are submitting your proposal under the BAA, enter your organization's name. If not, leave the name field blank.

Personnel Costs:			Months	Monthly		Proposed
	Name	Position Description	Budgeted	Costs	Overtime	FFY 1996
	- 1 -	- 2 -	- 3 -	- 4 -	- 5 -	0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
		Subtotal	0.0	0	0	- 6 -
					Personnel Total	$0.0

Travel Costs:		Ticket	Round	Total	Daily	Proposed
	Description	Price	Trips	Days	Per Diem	FFY 1996
	- 7 -	- 8 -	- 9 -	- 10 -	- 11 -	0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						- 12 -
					Travel Total	$0.0

1996	Project Number: Project Title: - 13 - Name: NON-TRUSTEE OR BAA PROPOSER	FORM 4B Personnel & Travel DETAIL

FORM 4B Contractual & Commodities DETAIL

HOW THE FORM WILL BE USED

This form is used to document contractual and commodities requirements of non-Trustee organizations. The total proposed for FFY 1996 rolls up to the FORM 4A.

DEFINITIONS

"Contractual" covers such items as communication, printing, advertising, charters, rental or lease of equipment, repairs and maintenance of equipment, utilities, and professional services.

"Commodities" are consumable supplies with an estimated life of less than one year and a value of less that $500.

HOW TO COMPLETE THE FORM

1. *Contractual Description* - Describe what is being purchased and the purpose.
2. *Proposed FFY 1996* - Input the proposed FFY 1996 Contractual cost. Refer to the Technical Section, Rules for Numbers for further guidance. The field is formatted to round to thousands.
3. *Commodities Description* - Describe what is being purchased and the purpose.
4. *Proposed FFY 1996* - Input the proposed FFY 1996 Commodities cost. Refer to the Technical Section, Rules for Numbers for further guidance. The field is formatted to round to thousands.
5. *Project Identification Field* - Enter the project number and title. If you are submitting your proposal under the BAA, enter your organization's name. If not, leave the name field blank.

Contractual Costs:	Proposed
Description	FFY 1996
- 1 -	- 2 -
Contractual Total	$0.0

Commodities Costs:	Proposed
Description	FFY 1996
- 3 -	- 4 -
Commodities Total	$0.0

1996	Project Number: Project Title: - 5 - Name: NON-TRUSTEE OR BAA PROPOSER	FORM 4B Contractual & Commodities DETAIL

FORM 4B Equipment DETAIL

HOW THE FORM WILL BE USED

This form is used to document equipment requirements of non-Trustee organizations. The total proposed for FFY 1996 rolls up to the FORM 4A.

DEFINITIONS

"Equipment" is considered non-consumable items having an estimated life of more than one year and a unit value of greater than $500.

HOW TO COMPLETE THE FORM

1. *Replacement Equipment* - Equipment requested for the replacement of equipment previously purchased by the Trustee Council should be indicated by placement of an R.
2. *New Equipment Description* - Describe the equipment being purchased and the purpose.
3. *Number of Units* - Enter number of units. Field is formatted to accept whole numbers.
4. *Unit Price* - Enter the unit price. The field is formatted to accept whole numbers.
5. *Proposed FFY 1996 New Equipment* - The form is set up to calculate based on the following formula. No input is necessary. The field is formatted to round to thousands. **(Number of Units x Unit Price) = Proposed FFY 1996 New Equipment**
6. *Existing Equipment Usage* - Describe existing equipment which will be used for the project.
7. *Number of Units* - Enter the number of existing units. The field is formatted to accept whole numbers.
8. *Project Identification Field* - Enter the project number and title. If you are submitting your proposal under the BAA, enter your organization's name. If not, leave the name field blank.

New Equipment Purchases: Description		Number of Units	Unit Price	Proposed FFY 1996
- 1 -	- 2 -	- 3 -	- 4 -	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 - 5 -
Those purchases associated with replacement equipment should be indicated by placement of an R.			New Equipment Total	$0.0

Existing Equipment Usage: Description		Number of Units	
- 6 -		- 7 -	

1996	Project Number: Project Title: - 8 - Name: NON-TRUSTEE OR BAA PROPOSER	FORM 4B Equipment DETAIL