12.6.3

Exxon Valdez Oil Spill Trustee Council

1994 Brief Project Descriptions of Approved Projects

March 10, 1994

Alaska Department of Environmental Conservation
Alaska Department of Fish and Game
Alaska Department of Natural Resources
United States of Agriculture, Forest Service
National Oceanagraphic and Atmospheric Administration
United States Department of Interior

TABLE OF CONTENTS

EXXON VALDEZ OIL SPILL PROJECT DESCRIPTION

Title: Site-Specific Archaeological Restoration and Cultural Resource Protection-Interagency

Project Identification Number: 94007

Lead Agency: ADNR **Cooperating Agencies:** NPS, USFWS, USFS

Cost of Project, FY94: 445.1 **Cost of Project, FY95:** 278.1

Project Startup Date: February 1994 **Duration:** 2 years

Geographic Area: Prince William Sound, Cook Inlet/Kenai Peninsula, Kodiak/Alaska Peninsula regions

INTRODUCTION: Increased public knowledge about archaeological site locations and increased site vandalism as a result of the Exxon Valdez oil spill have made native and non-native people in the Prince William Sound (PWS) and Gulf of Alaska (GOA) areas more concerned with protecting cultural resources. Communities within the spill-affected area are increasingly concerned that archaeological materials remain or at least are regularly returned to their area of origin for display. The increasing loss of artifacts and disturbance of graves can be reduced by stabilizing sites, preserving artifacts and interpreting native heritage within the region. Cooperation between communities and major land management agencies in cultural resource protection strategies is one way of lessening the sense of loss due to the oil spill and creating a sense in PWS and GOA communities that damage to cultural resources has been counteracted.

An effort was begun during 1993 by land managing agencies to document status of damaged sites, devise plans for restoring those sites and begin restoration. Assessment of all existing and accessible oil spill response documentation revealed that there is solid evidence for substantive injury to 24 known sites that can be directly linked to the Exxon Valdez oil spill. The sources of injury include oiling, oil spill beach cleanup actions, and vandalism. Of these identified sources, cleanup activities and vandalism appear to have resulted in the most clear-cut cases of injury to archaeological sites (e.g. loss of diagnostic artifact, illegal excavation, disturbance of human remains). In June 1992 the Trustees convened a multi-agency panel of experts in the archaeology of the oil spill region, chaired by Martin McAllister. This panel gave thorough review of all available oil spill injury data and concluded:

1) Nineteen known archaeological sites were injured by cleanup activities or vandalism related to the oil spill.

2) Based on the total known sites and projected archaeological sites in the oil spill pathway supplied by Exxon Company contractors and a GIS/statistical study by the State University of New York, it is estimated that approximately 112 archaeological sites were injured by oil

spill cleanup, vandalism, or oiling from the spill.

One purpose of this project is to conduct site-specific restorative actions at injured archaeological sites on federal or state lands within the oil spill pathway. Thirteen of the nineteen sites documented as injured were scheduled for attention during 1993. Restoration plans were to be produced for most sites as part of 1993 activities. Only a few sites were completely restored. Physical stabilization began on some sites during 1993 but restoration is not complete. Guidance for the proposed work is drawn from Section 14 of the Archaeological Resources Protection Act (ARPA). None of the planned work duplicates previous studies. It is based on the findings of those studies and carries out recommendations to the next level of restoration.

The other purpose of the project is to compile information about the current wants and needs of local communities and agency efforts to protect cultural resources and to provide coordinated guidance for future protection.

PROJECT DESCRIPTION

1. **Resources and /or Associate Services:** The resources to be restored by this project are archaeological sites damaged during the cleanup phase of the Exxon Valdez oil spill. Out of the 19 sites identified as impacted four sites occur in the Prince William Sound area; four sites in the Kenai Peninsula area; and 11 sites in the Kodiak Island/Alaska Peninsula area. All were identified by the archaeology panel as impacted by vandalism or cleanup activities. Restoration examinations during the FY93 project are providing plans for restoring the sites during the FY94 or have initiated restoration to be further addressed during the proposed activities. Artifacts obtained during cleanup and damage assessment activities need to be preserved and stored as well.

2. **Objectives:** The first objective of the project is to conduct site-specific restorative action at injured archaeological sites. Detailed work plans by each agency will be completed by February 28, 1994. Fieldwork will be initiated by June 1, 1994. The second objective is the compilation of information about current preservation programs relating to the oil spill and development of recommendations about preservation of artifacts from the spill activities and protection of injured archaeological sites. Draft reports will be completed by December 1, 1994, and final reports completed by May 31, 1995.

3. **Methods:** The FY94 phase of archaeological site restoration will involve completing damage assessment at sites not previously examined adequately. Restoration will be the major activity under the project at sites where assessment was initiated or completed during the FY93 phase.

Restoration measures will include the following measures:

1. Further analysis of injury at the balance of identified sites with no identification of additional sites.

2. Recovery analysis and curation (and where appropriate, repatriation) of any

remaining archaeological resources that were exposed or disturbed by oil spill related injury.

3. Data recovery to compensate for the loss of important archaeological information at injured sites and/or the stabilization and physical repair of disturbed areas within injured sites.

Development of the preservation strategies will include consultation with local cultural preservation groups and museums in the spill area about local programs, analysis of agency efforts and development of recommendations for each area. Consideration will be aimed at artifact collections produced from damaged sites and strategies for protection of injured archaeological sites.

4. **Location:** This project will occur in remote areas of Prince William Sound in the oil spill pathway, on the outer coast of the Kenai Peninsula, in the Kodiak archipelago and on the Alaska Peninsula shore of Shelikof Strait.

5. **Technical Support:** Tests for the presence of petroleum hydrocarbons and radiocarbon dating at injured archaeological sites are the technical support items for this project. An estimated 100 samples of sediment from sites examined under this project will have HPLC/UV fluorescence examinations done on them. An estimated 20 radiocarbon samples will be processed from the examined sites in order to test whether that method of dating has been effected.

6. **Contracts:** Contracts anticipated under this project are for boat and airplane charters and contract award will follow standard agency procedures. All activities will be accomplished in-house by agency archaeologists. Those archaeologists have been actively involved in damage assessment and prior restoration efforts and are more knowledgeable of the resource than most non-agency archaeologists. They will provide continuity in the restoration process.

SCHEDULES:

Approval of detailed work plans- April 30, 1994
Technical support and transportation contracts finalized- June 15, 1994
Fieldwork startup- June 15, 1994
Draft final report- December 31, 1994
Final report complete- May 31, 1995

Project personnel:
ADNR- Judith E. Bittner (project leader), Douglas Reger (Principal investigator)
USFS- John Mattson (Co-principal investigator)
NPS- Ted Birkedal (Co-principal investigator)
USFWS- Chuck Diters (Co-principal investigator)

EXISTING AGENCY PROGRAM:

The federal agencies will continue to perform archaeological work necessary to comply with Section 106 of the National Historic Preservation Act required by normal, non-spill related activities. No archaeological activities are anticipated in the spill area which will duplicate the proposed restoration work. No other archaeological activity is planned by the State in the oil spill area.

ENVIRONMENTAL COMPLIANCE/PERMIT /COORDINATION STATUS

The work proceeding during FY93 which is preliminary to or identical to the FY94 project, was determined by the National Park Service to not constitute a major federal action affecting the quality of the human environment. The National Park Service will provide the environmental analysis for the FY94 project which is also anticipated to not be a major federal action.

PERFORMANCE MONITORING

The final report will consist of a standard archaeological project report as described by the Secretary of the Interior's standards for reporting. A draft of the final report will be submitted following receipt of results from sediment and radiocarbon analysis (approximately December 31, 1994).

FY94 BUDGET ($K)

AGENCY	ADNR	USFS	FWS	NPS	TOTAL
Personnel	166.1	54.1	15.5	20.7	256.4
Travel	10.7	2.0	2.5	10.2	25.4
Contractual	109.2	32.1	0.0	79.0	220.3
Commodities	8.8	10.8	0.0	2.5	22.1
Equipment	2.9	5.8	0.0	0.0	8.7
Capital Outlay	0.0	0.0	0.0	0.0	0.0
Sub-total	297.7	104.8	18.0	112.4	532.9
General Administration	32.6	10.4	2.3	8.6	53.9
TOTAL	330.3	115.2	20.3	121	586.8

EXXON VALDEZ OIL SPILL PROJECT DESCRIPTION

Title: Black Oystercatcher Interaction with Intertidal Communities

Project Identification Number: 94020

Lead Agency: DOI-FWS

Cooperating Agency: None

Cost of Project, FY94: $148.8K **Cost of Project, FY95:** $19.6K

Project Startup Date: October 1993 **Duration:** 1.5 years

Geographic Area: Field data collection - Prince William Sound, AK; data analysis - Anchorage, AK; hydrocarbon analysis - GERG, Texas A&M University

INTRODUCTION

Black oystercatchers (*Haematopus bachmani*) were directly and indirectly affected by the *Exxon Valdez* oil spill. Oystercatchers died as a result of contact with crude oil. Disturbance caused by shoreline oiling and subsequent cleanup actions disrupted the breeding activities of oystercatchers in Prince William Sound (PWS) during 1989 and 1990. Because black oystercatchers take five years to reach sexual maturity, reproductive losses incurred in 1989 and 1990 could lead to low recruitment and a population decline in 1994 and 1995. Although the number of breeding pairs increased on Green Island (oiled) from 1989 to 1992, it decreased on Knight Island (oiled) from 1991 to 1992.

Black oystercatchers were also affected indirectly by the spill. Since 1991, concentrations of petroleum hydrocarbons in mussel beds (*Mytilus trossulus*) have been monitored in PWS. Hydrocarbon concentrations in some mussels and their underlying substrates remained relatively unchanged between 1991 and 1992 and visible signs of oil were still present in substrates in 1993. Continued hydrocarbon contamination of invertebrates could provide chronic exposure of intertidal consumers to oil. The obligate use of intertidal foraging areas by black oystercatchers make them susceptible to chronic exposure from oiled prey.

In 1992, 10 sediment samples from oystercatcher feeding sites on Knight Island had detectable concentrations of petroleum hydrocarbons. Within sites which supported dense mussel beds, the byssal thread mat clearly retains underlying oil. However, detectable concentrations of petroleum hydrocarbons not only occurred in dense mussel beds, but also in substrates that supported only moderately dense aggregations of mussels and lacked a well-developed byssal mat. Thus, the potential for exposure of oystercatchers to persistent oil extends beyond dense, oiled mussel beds and, may even include persistent oiling in other prey species. Other intertidal invertebrate species were also collected for hydrocarbon

analysis in 1993 to ascertain the relationship between other prey species and persistent oiling.

Black oystercatchers did not avoid feeding in or delivering prey to chicks from persistently oiled substrates. During 1991 and 1992, chicks raised in nesting territories that included persistently oiled substrates gained weight slower than chicks raised in unoiled territories. This occurred despite being provided more food. Low weight gain coupled with high food consumption is suggestive of oil ingestion. To verify exposure to oil, fecal samples of oystercatcher chicks were collected in 1992 and 1993, and these are currently undergoing analysis to determine hydrocarbon concentrations.

The occurrence of detectable amounts of hydrocarbons in fine sediments underlying mussel beds scattered throughout PWS, indicates that breeding oystercatchers are subject to broad risks of chronic oil exposure. Little is known on how reduced chick growth rates translate to overwinter survival of chicks and, eventually, recruitment into the breeding population. The summer of 1994 represents the first year that oystercatcher chicks fledged in the oil spill year of 1989 have the potential to enter the breeding population. Continued individual and population monitoring is needed to determine the magnitude and duration of chronic effects of the *Exxon Valdez* oil spill on black oystercatchers in PWS.

PROJECT DESCRIPTION

A. Resources and/or Associated Services:

The resources to be studied are black oystercatchers inhabiting territories that include oiled mussel beds, and possibly, other contaminated prey, and those inhabiting unoiled territories within PWS.

B. Objectives:

1. To determine if continued persistence of hydrocarbons in mussel beds, and other fine-grained substrates is being transferred to oystercatcher chicks via the food chain and is responsible for depressed growth rates during the 1994 breeding season.

2. To determine the extent of use of oiled substrates by foraging oystercatchers during June and July of 1994.

3. To monitor changes in the breeding population of black oystercatchers in oiled and unoiled areas of central PWS.

C. Methods:

Observations of feeding adults will be made to document specific areas of potential exposure. All feeding sites suspected of containing oil will be thoroughly searched for the presence of oil. A list of beach segments containing visible or olfactory signs of oil will be

compiled and transmitted to NOAA for inclusion as oiled mussel bed sampling sites.

To determine exposure to oil, fecal samples of chicks, beginning when they are seven days old, will be collected at seven-day intervals. Feces will be placed in a solution of dichloromethane and kept in frozen storage. All samples from each nest site will be pooled, to maximize the chance of detecting hydrocarbons, and submitted for hydrocarbon analysis. Fecal samples will be sent to the Geochemical and Environmental Research Group of the Texas A&M University for gas chromatography-mass spectroscopy determination of aliphatic hydrocarbon (AH) and polycyclic aromatic hydrocarbon (PAH) concentrations. Indices of oil contamination of feces of chicks raised in territories that include oiled substrates will be contrasted with those raised in unoiled territories.

Analyses of regurgitated prey items and blood samples have been considered as alternatives to collecting fecal samples. In both instances, these techniques were deemed inappropriate for small chicks that might already be stressed. Because hydrocarbons are identifiable in the feces of birds, the ease of collecting the material makes fecal sample analysis the most viable technique for establishing the link between oiled mussel beds and oil in the tissue of oystercatchers.

The effects of oil exposure on oystercatcher chicks will be assessed by measuring weights, tarsus lengths and bill lengths of all chicks present at the nest site at seven-day intervals. An
index of growth (instantaneous change in weight/instantaneous change in tarsus length) will be contrasted between chicks raised at chronically oiled and those raised at unoiled sites.

The number of breeding pairs occurring on Green and Montague islands, where work has been conducted since 1989, and on Knight Island will be counted to monitor population changes and recruitment into the breeding population. Counts in 1994 will be graphically compared to counts made in previous years.

D. Location:

Primary study sites will include Green, Knight and Montague Islands, PWS, Alaska.

E. Technical Support:

Hydrocarbon analysis and interpretation of results from fecal samples, mussel and sediment samples will be performed by Texas A&M University and NOAA, as appropriate. **F. Contracts:**

Food, lodging, freezer storage, and laboratory space at the study site (vessel) will be awarded through a competitive bid. FWS currently does not have a vessel available that can support a long-term research project in PWS.

Analysis of *Exxon Valdez* tissue samples collected by FWS for the presence of petroleum hydrocarbons, including analysis by gas chromatography-mass spectroscopy of

oystercatcher feces, was awarded to the Geochemical and Environmental Research Group of the Texas A&M University through a competitive, multi-year contract. The complexity of analytical procedures to determine hydrocarbon contamination and the specialized equipment needed to conduct analyses necessitates an outside contract.

Vessel maintenance and repair that requires expertise and equipment beyond what is available at the Regional Office of FWS is awarded to local Anchorage businesses through competitive, multi-year bids. Work on vessels used in this project is performed by Magnum Marine and Sea Marita Boatworks.

Warehouse space, for the storage of vessels and equipment, was awarded to an Anchorage facility through an open, multi-year competitive bid.

SCHEDULES

1994		
	Feb 1 - May 20	Logistical planning and safety training
	May 21 - Aug 10	Field data collection
	Aug 11 - Oct 31	Data entry, data analysis and fecal sample analysis
	Nov 1 - Jan 29	Draft 1993 report writing and internal review
1995		
	Jan 30	Draft report submitted for peer review
	Mar 30	Peer review comments returned to USFWS
	May 31	Final report submitted for peer review

EXISTING AGENCY PROGRAM

No other agency program monitors the interaction of black oystercatchers and oiled prey resources in the spill area. The EVOS boat survey project monitors the population of oystercatchers in PWS on a large scale. Logistical support, including a 25' boat ($70K) and various field camp needs ($5K), is provided by the USFWS.

ENVIRONMENTAL COMPLIANCE/PERMIT/COORDINATION STATUS

This study is a non-intrusive study primarily involving observations and infrequent handling of live birds. No birds will be collected. Samples of oystercatcher fecal material and food items will be collected for analysis of hydrocarbon content. Based on a review of CEQ regulation 40 CFR 1500-1508, this study qualifies for a categorical exemption from the requirements of the National Environmental Policy Act, in accordance with 40 CFR 1508.4.

PERFORMANCE MONITORING

A report that summarizes the 1994 data and compares it to data collected in previous years

will be prepared and submitted for peer review by the designated deadline.

FY94 BUDGET ($K)

AGENCY	USFWS
Personnel	15.0
Travel	0.0
Contractual	0.0
Commodities	0.0
Equipment	0.0
Capital Outlay	0.0
Sub-total	15.0
General Administration	2.3
TOTAL	17.3
NEPA COMPLIANCE	0.0

EXXON VALDEZ OIL SPILL PROJECT DESCRIPTION

Title: Common Murre Population Monitoring

Project Number: 94039

Lead Agency: DOI-FWS

Cooperating Agency: None

Cost of Project, FY94: $227 2K **Cost of Project, FY95:** $30.0K

Project Startup Date: October 1993 **Duration:** 4 years

Geographic Area: Field work will be conducted on East Amatuli and Nord islands in the Barren Islands, northwestern Gulf of Alaska, and data will be analyzed at the U.S. Fish and Wildlife Service Alaska Maritime National Wildlife Refuge office in Homer, Alaska.

INTRODUCTION

Murres (*Uria* spp.) were heavily affected by the T/V *Exxon Valdez* oil spill (EVOS). Prior to the event, about 250,000 common and thick-billed murres (*U. aalge* and *U. lomvia*) nested at 27 colonies in the area of the western Gulf of Alaska covered by the spill. When winds and currents swept spilled oil through the region during April and early May, large numbers of these diving, fish-eating alcids were already aggregating in pre-breeding concentrations in waters near the nesting colonies and many of these birds died during the spill. About 75% of the 35,000 bird carcasses recovered during and shortly after the event were murres, and estimates of murre losses were in excess of 100,000 individuals. After the oil spill, fewer murres were found at the Barren Islands colonies compared to historical data, and timing of breeding was later than historical pre-spill dates. Also, based on Nord Island data, production of chicks was almost zero in both 1989 and 1990, and still low in 1991 and 1992 compared to colonies outside the spill zone.

PROJECT DESCRIPTION

This project is designed to continue to monitor trends in numbers, productivity, and phenology of common murres at colonies in the Barren Islands that were affected by the spill.

A. Resources and/or Associated Services

Common murres are the injured resource that will be studied. Restoration monitoring of

common murre colonies in the Barren Islands will provide further information on the degree of injury sustained by these Gulf of Alaska populations. It will also provide important information on rates of recovery of murre populations and supply a basis for testing hypotheses on why nesting events may have been delayed at these colonies after the spill (e.g., abnormally late egg-laying dates). Also, data obtained during the work can be used to better predict the extent of injuries to nesting populations during future spills (e.g., losses of birds, recovery rates).

B. Objectives

The primary objectives of this project are to monitor trends in populations numbers, productivity, and timing of breeding activities of common murres in the Barren Islands, and to compare these parameters with pre- and post-spill Barren Islands murre data and data from murre colonies outside the spill zone. The population numbers, productivity, and phenology data will be collected during June - September, FY94.

C. Methods

All murres, with the exception of chicks, will be counted on population plots established in 1989-1992 by the USFWS, a series of plots established by University of Washington researchers in 1990-1992, and several new plots established by the USFWS in 1993. The counts will be made from boats and will follow standard accepted seabird colony census protocols that take into account timing of breeding activities, time of day, and number of observers. All plots will be counted more than once, weather permitting, and subsets of plots in each plot series will be counted several additional times (up to 10) during the census for purposes of statistical analysis.

Information on timing of nesting events and reproductive success of murres will be collected from a series of land-based plots established in 1989-1992 and several additional productivity/phenology plots setup in 1993 on Nord and East Amatuli islands. Observers will make regular visits to the plots during late June - early September to obtain data on egg-laying, hatching, fledgling, numbers of eggs and chicks per nest site, and numbers of birds and adult pairs.

Murre count data will be used to test the null hypothesis that there is no evidence that populations have increased in the Barren Islands since the oil spill. The sample unit will be the sum of the counts of birds on all plots on a given day. ANOVA will be used to determine if counts differ among years. Multiple comparisons will also be made if the null hypothesis is rejected. Regression analysis will be conducted to evaluate trends in numbers over the years since the spill.

Data on reproductive success and timing of nesting events will be compared with similar pre- and post-spill information collected at the Barren Islands by USFWS and University of Washington investigators and with data from other colonies. These data will also be used to continue monitoring post-spill trends in reproductive and phenological parameters. Statistical analysis will be employed as appropriate to make comparisons between years and between colonies.

No other alternatives are available to conduct the monitoring work and collect the types of information needed for comparisons with previous years. Methodologies used for censusing populations and measuring productivity are designed to detect and describe long-term trends. These methods follow standard procedures and protocols developed by seabird biologist working at large nesting colonies over the past 15 years.

D. Location

The murre restoration monitoring work will be conducted in the Barren Islands, located about 75 km south-southwest of Homer, Alaska between the Kenai Peninsula and the Kodiak Archipelago. Specific study sites are located on Nord and East Amatuli islands and East Amatuli Light Rock.

E. Technical Support

None

F. Contracts

A vessel will be chartered to supply camp operations and support population counts in the Barren Islands. It will be procured through standard competitive bid processes used by the Department of Interior. In addition, possibly two Student Conservation Association volunteers, will be contracted to assist field crews.

SCHEDULES

FY94 Milestones:

Oct - Dec 1993	Analyze 1993 data and prepare draft and final reports of 1993 activities.
Jan - Mar 1994	Prepare final report of 1993 activities; review and revise previous reports on murre restoration work to consolidate data collected by the USFWS and Exxon, archive data and population plot photos, recruit temporary personnel, plan field operations.
Apr - Jun 1994	Refine study plan, purchase equipment and supplies, hire temporary field personnel, train seasonal employees.
Jun - Sep 1994	Occupy field camps at Ushagat and East Amatuli islands to obtain data on reproduction success and timing of nesting events at plots on East Amatuli and Nord islands.
Jul - Aug 1994	Conduct population census work at East Amatuli and Nord islands and East Amatuli Light Rock.
Sep 1994	Clean and store equipment.

FY95 Milestones:

Oct - Dec 1994	Analyze 1994 data and prepare draft report of 1994 activities.
Jan - Mar 1995	Prepare final reports of 1994 activities, archive data and plot photos.

EXISTING AGENCY PROGRAM

As part of existing Alaska Maritime National Wildlife Refuge programs, murre populations at locations outside the spill zone will be monitored in a similar fashion for comparison.

ENVIRONMENTAL COMPLIANCE/PERMIT/COORDINATION STATUS

This study is a non-intrusive study and relies on observation from boats and from observation points removed from nesting ledges. Based on a review of CEQ regulation 40 CFR 1500-1508, this study has been determined to be categorically exempt from the requirements of NEPA.

PERFORMANCE MONITORING

A. Backup strategy

In the event either the program manager or the project leader leaves before the project is completed, the remaining member of the study team will assume the other person's duties until a replacement can be hired.

B. Quality assurance

Product quality will be ensured by: 1) using experienced personnel to collect and analyze data, 2) following accepted standard procedures and protocols, and 3) monitoring data entry procedures.

C. Products

A draft report of 1993 monitoring activities will be completed by December 31, 1993 and a final report of those activities will be produced by March 30, 1994. Also, a draft report of 1994 monitoring activities will be completed by December 31, 1994 and a final report of those activities will be produced by March 30, 1995.

FY94 BUDGET ($K)

AGENCY	FWS
Personnel	108.4
Travel	14.5
Contractual	57.0
Commodities	14.4
Equipment	12.6
Capital Outlay	0.0
Sub-total	206.9
General Administration	20.3
TOTAL	227.2

NEPA COMPLIANCE

This page intentionally left blank.

EXXON VALDEZ OIL SPILL PROJECT DESCRIPTION

Title: Introduced Predator Removal from Islands

Project Number: 94041

Lead Agency: DOI-FWS

Cooperating Agency: None

Cost of Project, FY94: $146.6K **Cost of Project, FY95:** $80.0K

Project Startup Date: February 1994 **Duration:** 2 years

Geographic Area: Western Gulf of Alaska

INTRODUCTION

Red fox (*Vulpes vulpes*) and arctic fox (*Alopex lagopus*) were introduced to most of the islands in southwestern Alaska for fur farming prior to 1930. These introduced predators reduced populations of native birds including black oystercatchers (*Haematopus bachmani*), common murres (*Uria aalge*), and pigeon guillemots (*Cepphus columba*), species injured by oil from the T/V *Exxon Valdez* spill. Removal of foxes would allow remnant populations of injured species to increase or extirpated species to recolonize. The islands selected for restoration are Chernabura and Simeonof in the Shumagin group at the western edge of the trajectory of the oil, and Kagamil in the eastern Aleutian Islands, an island where fox predation is likely now limiting murre populations.

PROJECT DESCRIPTION

A. Resources and/or Associated Services

Injured species affected by this project include the following: black oystercatcher, common murre, and pigeon guillemot. Other species that will benefit include storm-petrels, cormorants, Aleutian Canada geese, dabbling ducks, diving ducks, ptarmigan, shorebirds, jaegers, gulls, ancient murrelets , and tufted puffins.

B. Objectives

To restore native bird populations, particularly those injured by the spill, by removing introduced predators. Oystercatchers, murres, and guillemots are expected to increase substantially within 3 to 5 years after the removal of foxes.

C. Methods

All introduced foxes on selected islands will be killed by shooting and trapping. If authorization is obtained, M-44 cyanide devices will also be employed. Non-lethal methods are infeasible because it would be difficult to live-trap all the animals. It would also be prohibitively expensive to translocate the animals, even if a suitable release site were found.

Oystercatchers will be monitored by counting birds along entire coastlines of each island at least twice during the breeding season (May-July). Pigeon guillemots will be counted, within 2 hours of sunrise, around the periphery of each island at least twice monthly May - June. At Kagamil, murres will be counted on at least 5 days in July (mid-incubation to early chick-rearing). Counts will be made between 11:00 - 18:00 hours, the period of day when attendance is most stable at the colony. These counts will provide a basis for measuring the success of the project.

D. Location

Chernabura and Simeonof islands are near the edge of the path of the oil, and increases in populations of injured species there would aid in the restoration of populations in the spill area. Kagamil Island is west of the oil trajectory, but opportunities to enhance murre populations there could partially compensate for the loss of murres in the spill area.

E. Technical Support

None.

F. Contracts

None. The Alaska Maritime National Wildlife Refuge (AMNWR), where all sites occur, has been involved in removing introduced foxes from islands in the past and possesses the expertise and logistic capabilities to accomplish the task. The AMNWR has successfully removed introduced species on gitkin Island, Nizki Island, and Ushagat Island in the Gulf of Alaska. The species were successfully removed the first year with the results verified through an assessment program the next year. The AMNWR estimates that removal of introduced predators on the islands within this proposal should only take one year with verification of the results during the following year.

SCHEDULES

Feb - Mar 1994	Plans and preparations for field camps (e.g., ordering supplies, hiring personnel, arranging logistics, training)
Apr 1994	Training

Apr - May 1994	Trapping crews placed on islands
May - Jul 1994	Fox removed, and target bird species monitored
Aug 1994	Crews picked up and return to Homer
Aug - Sep 1994	Equipment maintenance and storage, report preparation
Oct 1994	Draft report submitted to review process
Feb - Mar 1995	Plans and preparations for field camps
Apr 1995	Training
May - Aug 1995	Islands rechecked to be sure no foxes remain and target bird species monitored for responses.
Sep - Nov 1995	Equipment maintenance and storage, final report preparation
Dec 1995	Final report submitted

EXISTING AGENCY PROGRAM

USFWS will provide field camp equipment including: boats, motors, tents, radios, etc., (approximately 50K), some ship time (approximately 20K), bunkhouse space (approximately 2K), and office space (approximately 5K), warehouse storage (approximately 2K), and staff time to recruit and train field personnel. No other fox removal efforts are planned in FY94 in the western Gulf of Alaska.

ENVIRONMENTAL COMPLIANCE/PERMIT/COORDINATION STATUS

NEPA compliance has already been completed on this project through the preparation of a 1985 Environmental Assessment addressing fox removal throughout the Aleutians and Alaska Peninsula areas and through the completion of the Comprehensive Conservation Plan for the Alaska Maritime National Wildlife Refuge completed in 1988. These reviews included consideration of the use of M-44. No additional NEPA analysis or review would be required if this project were approved.

PERFORMANCE MONITORING

A report will be submitted at the end of the 1994 summer field season detailing results of predator removal efforts and providing data on oystercatchers, guillemots, murres and other nesting birds. After islands are rechecked in 1995, a final report will be submitted.

FY94 BUDGET ($K)

AGENCY	FWS
Personnel	42.0
Travel	6.0
Contractual	0.0
Commodities	13.0
Equipment	16.7
Capital Outlay	0.0
Sub-total	77.7
General Administration	6.3
TOTAL	84.0

NEPA COMPLIANCE

EXXON VALDEZ OIL SPILL PROJECT DESCRIPTION

Title: Harbor Seal Habitat Use and Monitoring

Project Number: 94064

Lead Agency: ADF&G

Cooperating Agency: None

Project Cost, FY94: $153.3K ADF&G

Project Startup Date: October 1993 **Duration:** 2 years

Geographic Area: Prince William Sound

INTRODUCTION

Harbor seals are year-round residents of Prince William Sound (PWS) where they pup, breed, molt, and can often be seen hauled out on rocks, reefs, beaches, and glacial ice. During extensive surveys of PWS in 1991, 2,500 harbor seals were counted on haulouts. Another 1,700 were counted in the Copper River Delta and Orca Inlet. From 1984 to 1988, harbor seal numbers at trend sites in PWS declined by over 40% due to unknown causes. The decline continued in 1989-1990, exacerbated in oiled areas by the *Exxon Valdez* oil spill; 1990 counts were 57% lower than in 1984. Molting surveys in 1991 and 1992 suggest that numbers may have stabilized. However, pupping counts continued to decline: 1992 counts were 29% lower than those in 1990.

Harbor seals are important to Alaskan native residents of PWS for subsistence use. In 1985-1988, harbor seals made up 13%-27% of the total harvest of subsistence foods in Tatitlek and Chenega Bay. In addition to subsistence use, harbor seals are watched by tourists and other recreational users of PWS. Some harbor seals interact with--and are incidentally killed-- by commercial fishing activities. Like all marine mammals, they have federal protection under the Marine Mammal Protection Act. If the decline continues or if current population data are not available, harbor seals could be placed in a more restrictive legal classification.

Following the spill, counts of harbor seals at oiled trend-count sites declined by 43%, compared to 11% at unoiled sites, suggesting that over 30% of the seals at oiled haulouts died due to the spill. It is likely that 200-300 harbor seals were killed by the spill in PWS. Harbor seals encountered oil in the water and on haulouts and some became heavily oiled. Abnormally behaving seals were observed in oiled areas. Some oiled seals developed serious and probably lethal lesions in the brain. Elevated levels of hydrocarbons in bile of seals from oiled sites clearly indicated that seals had been exposed to and had assimilated oil into their tissues.

This study will take place in PWS and will provide information on trends in abundance, biology of the seals, and insight into possible causes for the decline. Data will benefit residents of Tatitlek, Chenega Bay, and other PWS communities that use harbor seals for subsistence. This data will also benefit PWS fishermen by ensuring that unnecessarily restrictive incidental take measures for harbor seals are not implemented due to lack of data. Information from this study may lead to management actions which will ensure that human activities do not have further impacts on harbor seals.

PROJECT DESCRIPTION

A. Resources and/or Associated Services

The resources/services which may benefit from this study include harbor seals, subsistence users, tourism and recreational viewing of harbor seals, and fisheries as they are also affected by harbor seal population status.

It cannot be assumed that the number of seals in oiled areas will return naturally to pre-spill levels. It is necessary to have current data to know whether seal numbers in PWS have stabilized or are continuing to decline following the spill. However, count data alone are of little help in explaining causes for the decline or designing conservation and management measures to facilitate recovery. There is no information on site fidelity, movements between sites, seasonal changes, habitats used for feeding, or feeding behavior. It is clear based on data from harbor seals that were satellite-tagged in spring 1992 and 1993 that some seals in PWS make unexpectedly long movements in relatively short periods of time, and that PWS seals spend more time in the Gulf of Alaska and the Copper River Delta than was anticipated. Areas of particular biological significance must be identified and appropriately managed in order to augment recovery in any way possible.

Under federal law, subsistence is the priority use of marine mammals. Data on seal abundance should be made available to the appropriate management agencies and shared with PWS residents so that hunters can self-regulate the seal harvest to ensure that the harvest is sustainable. If data are not current and adequate to determine that subsistence takes and fisheries removals are sustainable, this could result in very restrictive incidental take regulations for PWS salmon fisheries. While it is not clear what caused the declines prior to the spill, there is little question that the spill compounded the decline. Consequently, post-spill monitoring must continue until residual effects of the spill on harbor seal abundance are no longer evident.

B. Objectives

This study is designed to monitor the abundance and trends of harbor seals in oiled and unoiled areas of PWS in order to determine population trends following the spill. Additionally, this study will characterize habitat use and hauling out and diving behavior of harbor seals so that important habitat can be identified and properly managed. The

objectives are as follows:

1. Conduct aerial surveys of harbor seals at 25 trend count sites in PWS during pupping and molting in 1994;

2. Compare data from these surveys to data collected following the spill to determine whether counts of seals are increasing or decreasing;

3. Describe hauling out and diving behavior of satellite-tagged seals in PWS relative to date, time of day, and tide;

4. Describe use and frequency of movements between haulouts; and

5. Determine movement patterns within PWS and between PWS and adjacent areas.

C. Methods

The 1994 field study will include aerial surveys and satellite tagging. At the end of the 1994 season, data will be evaluated to determine whether another field season is desirable. If not, final data analysis and reporting will take place in 1995. Harbor seal abundance will be monitored by flying aerial surveys during pupping (June) and molting (August/September). A fixed-wing aircraft will be used to fly a survey of 25 trend count sites at an altitude of 700 feet. These 25 sites have been used for PWS harbor seal trend counts since 1984, including Natural Resource Damage Assessment (NRDA) and restoration studies in 1989-1993. The observer will count all seals and photograph large groups. Pups will be counted separately in June. Attempts will be made to survey each site 7-10 times during a survey period in order to reduce statistical variance of the counts. Methodology and observers will be the same as those used in 1989-1993. Several surveys will also be conducted of seals in the Copper River Delta to facilitate understanding of the relationship between seal counts in PWS and the Delta. Counts will be compared to data collected prior to and during the spill in order to document whether and how rapidly recovery in the oiled area occurs. Project investigators will travel to Chenega Bay and Tatitlek at least once each year to exchange information with village residents about survey results.

Satellite-linked time-depth recorders (Platform Terminal Transmitters or "PTTs") will be attached to 12 seals per year (6 each in spring and autumn) at a variety of locations in PWS in order to better evaluate geographical and seasonal differences in movements and behavior. Seals will be caught by entanglement in nets placed near haulouts and PTTs will be glued to their backs with epoxy resin. Each PTT will transmit signals to polar-orbiting satellites whenever the seal is hauled out or when it surfaces for a sufficient time. Sensor information will indicate when the animal is hauled out and dive depth and duration. PTTs will be shed during the annual molt in autumn. This project has a high probability of success. During 1991-1993, PTTs were attached to 14 seals and data were received for 3-67 days. Several seals made substantial movements within PWS and to the Gulf of Alaska and the Copper River Delta.

Aerial survey data will be analyzed using the means of site counts. Between-year comparisons of pup production and abundance during the fall molt will be done using logit and loglinear categorical models and bootstrapping. Data on geographic location and movements will be plotted using a computerized Geographic Information System (GIS). Rates of movement and average lengths and depths of dives will be calculated depending on location, date, and size of the seal. Hauling out periods relative to tidal stage will be examined by analyzing sensor data that indicates whether the seal is on land or at sea.

D. Location

Aerial surveys will be conducted of 25 trend count sites in PWS. Tagging work will take place at a variety of locations, with particular effort to attach tags to seals in southwestern PWS.

E. Technical Support

Computer, GIS, and statistical support will be provided by project personnel from the Alaska Department of Fish and Game's (ADF&G) Division of Wildlife Conservation. No hydrocarbon analyses will be needed.

F. Contracts

Cost of acquiring PTT data from Service ARGOS are paid through a contract with the National Oceanic and Atmospheric Administration (NOAA). This contract covers all ADF&G Wildlife satellite tagging projects and is processed by the Division of Wildlife Conservation. Charter aircraft for surveys will not require a contract Vessel support for tagging work will utilize a small vessels contract which is completed by the Principal Investigator. Satellite PTTs will be purchased under contract award from Wildlife Computers. This project will contribute funds to a Reimbursable Service Agreement (RSA) with University of Alaska, Fairbanks for blood physiology work on harbor seals in PWS, southeastern Alaska, and the Kodiak area.

SCHEDULES

This project will be conducted during 1994, with either a recommendation for additional field monitoring or submission of a final report in 1995. Aerial surveys will be conducted during June and August/September of each year. Each survey period will be 7-14 days, depending on weather and tides. One of the investigators will visit Chenega Bay and Tatitlek once a year to discuss survey results with residents. Satellite tags will be attached during 10-14 day periods in May and September of each year. Because a lead time of 3-6 months is required to obtain PTTs, they will have to be ordered by January 1994. Satellite data acquisition costs must be prepaid in early 1994. Data are received monthly and preliminary analysis will begin as soon as data diskettes are received. Final analyses cannot be completed until the PTTs have ceased to function (April-June 1995). A report of field

activities will be submitted in letter form within 30 days following any field activity. An annual progress report will be submitted by February 28, 1995 if requested by the Restoration Team, but due to the potential receipt of data as late as June, 1995, a final report may be delayed until December 31, 1995. Results will be prepared for publication in a peer-reviewed journal.

Dates	Activity
Jan, Feb 1994	Order PTTs
Feb 1994	Coordination meeting
Feb 1994	Reserve 1994 ARGOS satellite channels
May 1994	Attach six PTTs
June 1994	Conduct trend count pupping surveys
Aug-Sept 1994	Conduct trend count molting surveys
Sept 1994	Attach six PTTs
Ongoing, 1994-95	Retrieve ARGOS data
Oct-Nov 1994	Analyze survey data
Ongoing, 1994	Analyze satellite data
Jan, Feb 1995	Prepare final 1994 report
Feb 28, 1995	Submit final 1994 report
Jan-June 1995	Final data analysis
May-Aug 1995	Prepare final project report
Aug 31, 1995	Submit draft project report
Nov 1995	Revise final project report
Dec 31, 1995	Submit revised final project report

EXISTING AGENCY PROGRAM

The Division of Wildlife Conservation of ADF&G will not be conducting any other studies of harbor seal biology in PWS during 1994. The ADF&G will, however, be conducting harbor seal surveys and satellite tagging studies in southeastern Alaska and near Kodiak during 1994. All harbor seal studies will be closely coordinated in an attempt to better understand the overall health status and reasons for declines of harbor seals in PWS and other areas.

ENVIRONMENTAL COMPLIANCE/PERMIT/COORDINATION STATUS

NOAA is the lead federal agency for National Environmental Policy Act (NEPA) compliance for this project. NOAA determined that the harbor seal study (Project No. 94046) met NOAA agency requirements for Categorical Exclusion from the NEPA process and does not require an environmental assessment dated 18 December 1992. As required by the Marine Mammal Protection Act (MMPA), ADF&G has been authorized under Permit No. 770 to instrument up to 100 harbor seals with PTTs during the period 1992-1995. All MMPA permit

applications are reviewed by federal agencies and the U.S. Marine Mammal Commission and are available for review by state agencies and the public through a Notice of Receipt published in the Federal Register.

PERFORMANCE MONITORING

The PWS harbor seal project will be coordinated by the principal investigator who is a Marine Mammals Biologist with the ADF&G Division of Wildlife Conservation in Fairbanks. The PWS study will be one of three components in a statewide harbor seal study. The other two components are being managed by the Division of Wildlife Conservation in Anchorage. The involvement of these key personnel as a team will ensure that methodology for aerial surveys, satellite telemetry, data analysis, and other aspects of these projects will be consistent and coordinated. All three individuals were involved in 1991-1993 PWS harbor seal surveys and tagging studies and thus are thoroughly familiar with the proposed field activities.

Field trips to conduct surveys and attach PTTs will be scheduled 3-6 months in advance. A coordination meeting will be conducted to ensure availability of personnel and field logistics. Supervisors of support personnel have been consulted to determine their availability to this project. The ADF&G Fairbanks office has a GIS system available for project use. The investigators are highly qualified personnel with many years of experience conducting contractual research on marine mammals. They have a long track record of timely completion of high-quality work, and are recognized worldwide as experts in their field.

The final products to be generated will include a final report presenting methods, results, discussion of results, and conclusions regarding this study. The report will include analysis of aerial survey results in comparison to historical data from 1984 and 1988-1993. Data on movements and diving and haulout behavior will be presented as tables, graphs and figures. One of the investigators will travel to Chenega Bay and Tatitlek at least once per year to share the results with residents of these PWS communities.

FY94 BUDGET ($K)

AGENCY	ADF&G
Personnel	98.6
Travel	11.6
Contractual	82.7
Commodities	56.7
Equipment	0.0
Capital Outlay	0.0
Sub-total	249.6
General Administration	20.6
TOTAL NEPA COMPLIANCE	270.2

EXXON VALDEZ OIL SPILL PROJECT DESCRIPTION

Title: Harlequin Duck Recovery Monitoring

Project Identification Number: 94066

Lead Agency: ADF&G

Cooperating Agency: NOAA

Cost of Project, FY94: $283.8K **Cost of Project, FY95:** $200K

Project Startup Date: October 1, 1993 **Duration:** 4 years

Geographic Area: Prince William Sound

INTRODUCTION

The *Exxon Valdez* oil spill significantly affected harlequin ducks (*Histrionicus histrionicus*). The coastal zones in western Prince William Sound (PWS) and the Kodiak Archipelago were directly impacted by substantial amounts of oil during the spill. In addition to the direct mortality of at least 400 harlequins, oil spill surveys indicated a population decline in the spill region (Klosiewski and Laing, 1993), fewer potential breeders during pre-nesting, very little nesting activity near streams, and only a few broods within unoiled areas of the spill region from 1990 to 1992. In contrast, harlequin ducks reproduced in unoiled areas of eastern PWS and their population has remained relatively stable.

Poor reproduction is a significant and unexpected long-term effect. Because some harlequins spend their entire lives in the oil spill area, where they breed, feed, and over-winter, it is important to investigate oil-related impacts and to monitor this segment of the population. Non-resident harlequins, as well as other seaducks that over-winter in oiled areas may be similarly affected. Because these ducks breed in areas remote from the oil spill, it is impractical to study them.

Harlequin ducks are intertidal-feeding diving ducks. Both resident breeders and a wintering population are found in PWS. The residents breed along forested streams within a few kilometers of salt water, molt in secluded bays and lagoons, and roost on offshore rocks. Broods are found with hens on salt water in late summer. Wintering harlequin ducks breed alongside mountain streams elsewhere in Alaska, arrive on the south coast in October, and depart in May. Evidence from this study and the literature indicates harlequin ducks show a high degree of fidelity to both breeding and wintering areas.

Damage assessment studies of harlequin ducks through 1992 have been limited to PWS except for some 1990 collections of ducks around Kodiak Island for contaminant studies. The reproductive impairment of harlequin ducks in the oil spill area may be a chronic effect

of petroleum exposure through contaminated food from intertidal feeding areas. Harlequins collected in 1989-90 in western PWS and southwest Kodiak contained oiled food items in their gullets, or evidence of petroleum in liver tissues and bile. Harlequins depend year-round on a variety of intertidal invertebrates, resources that were heavily contaminated during spill. Blue mussels (*Mytilus*) are an important prey species. Blue mussels are known to concentrate and hold pollutants in their tissues. Over 50 blue mussel beds currently retain oil in western PWS. Petroleum trapped in the sediments beneath the byssal thread mats is unweathered and retains toxic components for many years. Restoration Study #103 documented high concentrations of polynuclear aromatic hydrocarbons (PAHs) remaining in mussels, byssal thread mats, and underlying substrates in western PWS.

Experimental studies reported in the literature show that single small doses of petroleum can cause a variety of physiological effects in waterfowl and seabirds, including injury to vital endocrine functions that regulate metabolism and reproduction. Small amounts of experimentally applied crude oil showed rapid and complete cessation of breeding in some seabirds. In addition, oil ingestion may affect birds' ability to depurate environmental pollutants and may trigger a downward spiral in general health and condition.

The most important conditions for success are: (1) establishment of a monitoring program for summer population structure and detection of reproductive effort; and (2) mitigation of physiological impairment that may result from contaminated foods in their environment. Otherwise, improvements in productivity from enhancement efforts will be undocumented or ineffectual. Continuation of the 1991-1993 breeding bird and brood surveys is necessary to detect recovery or decline of breeding harlequins. Collateral data on their habitat requirements and use patterns will prove valuable for evaluating habitat acquisitions and guiding continued restoration programs.

Evidence of oil ingestion and physiological effects on harlequin reproduction have been investigated through 1993. If effects are indicated four years after the spill, in-depth studies may be warranted and the importance of remedy for contaminated intertidal feeding sites could become paramount for harlequins. As a matter of policy, contaminated blue mussel beds were not to be cleaned as part of the spill response activities. Some of these intertidal sites remain heavily contaminated. National Marine Fisheries Service's (NMFS)studies of intertidal zone recovery and contamination of invertebrates are a vital corollary to the harlequin duck project.

Because of the consequences of a continued reproductive failure, it is particularly important to understand what factors are responsible for limiting reproduction. Given the lack of recovery and the suspected high degree of site fidelity of harlequins, it cannot be assumed that the population in oiled areas will return to pre-spill levels. In fact, the population may continue to decline because of a limited recruitment. It is necessary both to continue monitoring population and reproductive trends and to identify what factors may be limiting recovery.

PROJECT DESCRIPTION

A. Resources and/or Associated Services:

The goal of this project is to continue monitoring harlequin duck productivity and factors that may affect it. Proposed surveys will provide trend indices to breeding as well as opportunistic data on other avian species that summer in PWS. Specific information on habitat associations and structure of the breeding population will provide a measure of recovery or guide development of further investigations. Such information will be useful for evaluating habitat acquisitions, intertidal habitat restoration projects that benefit a variety of species (e.g. shorebirds, sea otters), and managing human interactions with wildlife in the spill region.

B. Objectives:

The objectives of this study are to: (1) document abundance, distribution, and age-sex structure of the pre-nesting population in April-June breeding bird surveys; (2) document annual harlequin production and post-breeding abundance through brood surveys; (3) strengthen the database on coastal habitat use patterns by correlating survey observations to classified shorelines; and (4) pending 1993 results of contaminant analysis of harlequin tissues and blood chemistry, document continued exposure of sea ducks to oil and physiological links to reproductive impairment through blood and tissue sampling.

C. Methods:

This project uses established methodology derived during previous harlequin duck damage assessment studies and restoration studies throughout PWS including comprehensive boat surveys of shorelines and suitable breeding streams during April-June. Extensive shoreline brood surveys will be conducted by boat during late July and August. Results from the oil spill area will be compared to 1990-93 results and to data collected in unoiled areas of eastern and southern PWS. Habitat use associations will be recorded during both surveys and integrated with a database being developed from previous work.

Contingent on 1993 results indicating evidence of continued oil ingestion by harlequins or physiological anomalies related to reproduction, an effort may be mounted to sample blood and/or tissues from breeding harlequins in 1994. Blood samples could be analyzed for normal blood parameters and abnormalities. Presence of elevated levels of haptaglobins and interleukins in blood sera or positive P450 enzyme activity may indicate continued petroleum exposure.

D. Location:

The proposed project will be conducted in the oil spill area of Prince William Sound and unoiled eastern PWS from Valdez to Cordova.

E. Technical Support:

Dr. D. M. Fry will conduct necropsies in the field, provide blood chemistry interpretation following analysis of clinical chemistry by California Veterinary Diagnostics, West Sacramento, California, perform plasma electrophoresis for evidence of protein changes, and provide histologic interpretation of tissues. NMFS Auke Bay Laboratory will perform hydrocarbon analyses of any food items and tissues that are collected.

F. Contracts:

A contract will be issued for technical support to the University of California, Davis.

SCHEDULES

Because recovery of the breeding harlequin duck population is expected to be slow, this monitoring program is projected to require additional four years. Work proposed beyond 1994 should be derived from adaptive planning. This project will be conducted during the 1994-1995 field season, with survey effort focused on April-June and July-August periods. Interim analyses and reporting will occur throughout 1994 and early 1995. Laboratory analyses should be completed by December 1, 1994. Report preparation will begin in September, and a final report for the 1994 season will be completed before January 30, 1995.

EXISTING AGENCY PROGRAM

There are no other agency or non-agency contributions to this project during the period of October 1, 1993 to September 30, 1994. ADF&G will not conduct activities related to the harlequin duck resource for this time period in the oil spill area.

ENVIRONMENTAL COMPLIANCE/PERMIT/COORDINATION STATUS

The U.S. Fish and Wildlife (FWS) is the lead Federal agency for National Environmental Policy Act (NEPA) compliance for this project. This project meets FWS agency requirements for Categorical Exclusion from the NEPA process.

PERFORMANCE MONITORING

This study will be conducted and managed by the Division of Wildlife Conservation, Waterfowl Program, under supervision of the Waterfowl Coordinator. Data collection will be accomplished by Division staff during field periods, with data analyses and reporting assigned to appropriate project participants. The Waterfowl Coordinator will be responsible

for administrative and technical aspects of the project, including planning and budget preparation, tracking expenditures, personnel assignments, contract oversight, and quality control of products.

Data collection will be controlled by employee training, supervision and compliance with methods and techniques described in SOP's. Chain-of-custody procedures as outlined in State/Federal Damage Assessment Plan: Analytical Chemistry QA/QC are being followed. Samples and data will be archived at the Department of Fish and Game. The products of this study will be a final report with maps, figures, and tables.

FY94 BUDGET ($K)

AGENCY	ADF&G	NOAA	TOTAL
Personnel			0.0
Travel			0.0
Contractual			0.0
Commodities			0.0
Equipment			0.0
Capital Outlay			0.0
Sub-total	0.0	0.0	0.0
General Administration			0
TOTAL	0	0	0
NEPA Compliance	0.0		

EXXON VALDEZ OIL SPILL PROJECT DESCRIPTION

Title: Herring Bay Experimental and Monitoring Studies

Project Number: 94086

Lead Agency: ADF&G

Cooperating Agency: None

Project Cost, FY94: $531.4K ADF&G

Project Startup Date: October 1993 **Duration:** 4 years

Geographic Area: Herring Bay, Knight Island, Prince William Sound

INTRODUCTION

Following the *Exxon Valdez* oil spill and subsequent clean-up activities, research was conducted within the intertidal zone throughout the oil-affected regions in Prince William Sound (PWS), Cook Inlet - Kenai Peninsula (CIK), and Kodiak - Alaska Peninsula (KAP) during the Coastal Habitat Injury Assessment project (CHIA). The Herring Bay Experimental and Monitoring Studies were conducted entirely within Herring Bay, Knight Island, PWS. Both data sets show clear injury to intertidal invertebrates and algae, especially in the mid- to upper-intertidal zones. Experiments in Herring Bay have concentrated on understanding recruitment and community structuring processes. The dominant organism in this community is the seaweed *Fucus gardneri*, constituting up to 90% of the algal biomass. Because of its abundance, this alga serves as habitat and food for a variety of invertebrates. Invertebrates, in turn, serve as an important food source for marine mammals, birds, and fishes. The Herring Bay study is designed to examine the impact of oil on relationships among intertidal invertebrates and plants, and to provide detailed monitoring of the recovery of intertidal communities over the long term.

Results from recent studies indicate that plants and animals living in the upper portion of the intertidal zone suffered the most extensive injury and have shown the least recovery. *Fucus* was severely injured by the oil spill and subsequent clean-up efforts. In some areas, entire *Fucus* beds were decimated by the combined effects of oil and cleanup, leaving many beaches virtually devoid of upper intertidal *Fucus*. Natural recovery of *Fucus* beds has been slow. It may take up to ten years for *Fucus* to fully recover by natural means. Current data indicates that recolonization of injured shorelines was beginning to occur in 1992. In some areas the density of large *Fucus* plants was greater at oiled sites than at control sites; while in other areas densities at oiled sites continue to be depressed. Several invertebrate species, especially the limpets *Tectura persona* and *Lottia pelta*, have shown lower densities at oiled sites compared to those on control sites, probably due to a lack of food and shelter normally provided by *Fucus*. Barnacles recruit on oiled surfaces, but their

settlement rate is low. Our studies show poor subsequent survival of barnacles that settle on oiled tiles. The CHIA study found significantly higher densities of *Chthamalus dalli* on oiled sites than control sites for the second and/or third meter vertical drop in all three regions. In undisturbed systems, *Chthamalus* species tend to be restricted to the highest zones in the intertidal, as they are excluded by the superior space competitors, *Balanus glanula* and *Semibalanus balanoides*, in the lower intertidal. *Chthamalus dalli* appears to be the barnacle species that initially benefitted from the free space created by the oil spill and clean-up activities. Recruitment monitoring and post-settlement survival studies within the barnacle zone to determine the fate of *C. dalli* relative to *B. glandula* and *S. balanoides* will continue.

Mussel size and age data for sites sampled during the CHIA study indicate that mussels of a given age tend to be larger on oiled sites relative to control sites. These size differences may be due to natural growth rate differences. On oiled sites in the CIK region, many key intertidal species had a higher biomass and abundance than on control sites, especially in coarse-textured habitats. Most of the oiled, coarse-textured sites were located on the outer Kenai Peninsula coast where they are exposed to major currents. The mussel growth, abundance, and biomass data suggest that sites that were the richest and most productive due to prevailing currents tended to be the ones most likely to be oiled. This question will be addressed in Herring Bay by attempting to correlate water motion with recruitment and mussel growth rates. Preliminary results from the ongoing mussel study in Herring Bay indicate that water flow is greater at oiled sites. The possibility that oiled sites are more productive than non-oiled sites must be investigated because of the extensive use of matched oiled and unoiled site pairs in damage assessment and in establishing projections of recovery times and determining recovery endpoints. This knowledge will also be useful in designing monitoring studies and assessing impacts of future perturbations.

PROJECT DESCRIPTION

A. Resources and/or Associated Services

The resource targeted for this study is the intertidal community within the spill impacted area, using Herring Bay as the experimental and monitoring site. To fully understand the dynamics of recovery, it is essential that monitoring of the intertidal zone continue. Monitoring until population densities stabilize at oiled sites will allow a more thorough assessment of the original injury observed. If there are differences between recovery end-points at oiled sites and paired control sites, a correction for the difference in the initial analyses can be made. Pre-spill densities of many organisms are expected to be greater at oiled sites than at the control sites.

B. Objectives

1. Quantify recruitment rates, survivorship, and population dynamics of barnacles and other invertebrate species, such as limpets and littorines, at matched oiled and non-oiled sites.

2. Compare mussel and barnacle recruitment rates and mussel and *Fucus* growth rates relative to water motion on matched oiled and control sites.

3. Monitor the natural recovery of the algal community and quantify the structure, population dynamics, and reproductive potential of *Fucus* in oiled and control sites to assess recovery rates, especially in the upper intertidal areas.

4. Assess the competitive interactions between *Fucus* and other algal species in recolonizing bare patches in the upper intertidal.

5. Oiling and current speed will be independently varied by using multiple oiled and unoiled sites with different current conditions.

C. Methods

1. Population dynamics of *Fucus*, sessile invertebrates, and grazers will continue to be quantified in established quadrants at six pairs of oiled and unoiled sheltered-rocky and coarse-textured sites. Organisms will be counted within six quadrants that have been permanently established within each of the first three meters of vertical drop below mean higher high water. The quadrants will be visited twice during the summer and the number of *Fucus* plants counted and size-frequency determined. Reproductive status and condition of the plants will also be recorded. Limpets, *Nucella spp.*, and *Littorina sitkana* will be counted, and subsamples of each will be measured. In addition, the populations of the major adult barnacle species will be monitored on three oiled sites to determine if the ratio of *Chthamalus dalli* to the two dominant species, *Balanus glandula* and *Semibalanus balanoides*, changes over time. On each site, four quadrants at each of the 0.5, 1.0, and 1.5 meter vertical drops were permanently marked during the 1993 field season. One section of each quadrant was scraped of all barnacles. An adjacent section was left unscraped. Both the scraped and unscraped quadrants will be monitored for recruitment of juveniles and abundance of adult barnacles.

2. Mussel recruitment (size-frequency distribution) will continue to be studied within the mussel band on three matched pairs of sites. In order to determine if there is a difference in growth rates between the oiled and control sites, mussel tagging experiments that were initiated in 1993 will continue. Indirect growth rate estimates, as determined by shifts in mussel size-frequency distributions (collections made twice during the field season), will be compared to direct growth measurements of individual mussels of varying sizes in order to resolve conflicting or inconclusive results previously reported. Quadrants were permanently marked along each of four transects on each site during the 1993 field season. All mussels in each quadrant were collected and are being

analyzed for size frequency distributions. The quadrants will be monitored for recruitment into the cleared area. In addition, new quadrants will be scraped within the mussel zone on transects placed one meter to the left of the old transects on each site. As mussel larvae tend to settle temporarily on filamentous algae, filamentous algal cover will be determined within each meter of vertical drop from mean higher high water during each field visit. Subsamples will be collected to determine the number of young mussels that have settled onto the algae.

3. Water motion studies will continue on sites where recruitment and growth studies are being monitored. Dissolution cylinders of calcium sulfate will be prepared by mixing Plaster of Paris and pouring it into plastic molds. Replicate cylinders will be deployed in the intertidal at each site in conjunction with recruitment and growth studies. Corrections will be made for cylinders deployed at different tidal heights and thus exposed to the tide for differing lengths of time. The data analyzed to date for cylinders deployed in 1993 show very low variance among replicates. The physical oceanographic survey of Herring Bay initiated in September 1993 will continue during 1994. The three dimensional flow field will be measured using an Acoustic Doppler Current Profiler (ADCP). The combined study will provide critical information on general circulation patterns, as well as how the tidal cycle influences water motion in Herring Bay during the spring and summer months.

4. Development of *Fucus* germlings to mature plants is important in their recovery since only mature plants can release eggs. Continued monitoring of the growth of established plants is necessary to determine if the higher growth rates at oiled sites will slow to rates similar to the control sites, indicating recovery of the population. To assess growth rates and more accurately estimate recovery time from germling recruitment to mature plant, the growth of established *Fucus* plants of various sizes in all tidal levels at oiled and control sites in Herring Bay will continue to be measured. This study is a continuation of studies initiated in 1991 and the same plants will be used. Tagged plants in three size classes (2-4.5 cm, 5-9.5 cm, and >10 cm) located at three tidal levels will be measured. Plants will be measured twice throughout the summer.

5. Evidence indicates that ephemeral algae colonized better in areas devoid of *Fucus*; while in areas where the *Fucus* beds remained relatively intact, ephemeral algae were less abundant. *Fucus* may release allelochemicals which inhibit the establishment of other algae. To investigate this, monitoring of cleared plots with various sized buffer zones that were established in 1993 will continue. Each replicate consists of four plots, one for each buffer zone treatment plus an unmanipulated control. Circular buffer zones of 50 cm, 1 m and 2 m were cleared around monitored plots. The sampling area consists of a cleared 25 cm radius circle. Percent cover, understory cover, and primary space occupancy will be recorded.

6. The settlement rate of *Fucus* eggs has been significantly lower at oiled sites compared to control sites. Because settlement of *Fucus* eggs is one of the limiting factors in *Fucus* recovery, monitoring of the number of eggs settled on oiled and control beaches over a 24-hour period will continue. Grooved plexiglass plates (5x7 cm) will be placed at three tidal levels (0.5, 1.0, and 2.0 MVD) at four pairs of sheltered-rocky sites. Each site will have four transects with three plates, one at each tidal level. After 24 hours, plates will be collected and the eggs will be counted.

D. Location

The proposed monitoring studies will be conducted in the Herring Bay and Knight Island area of Prince William Sound. Intertidal studies were initiated in Herring Bay in May 1990 and have continued through the 1993 field season. Herring Bay was heavily oiled in 1989 and was a central area for clean-up efforts. The bay was chosen for experimental studies because of its oiling history and close proximity to non-oiled sites used as controls. By monitoring populations within Herring Bay, the dynamics of recovery in the intertidal community within the spill impacted area will be better understood.

E. Technical Support

Principal Investigators from the University of Alaska, School of Fisheries and Ocean Sciences, will cooperate to provide expertise on different aspects of the intertidal study: invertebrate and algal taxonomy and ecology. All mobilization/demobilization efforts associated with the charter vessel will be accomplished through the Seward Marine Center in Seward, Alaska. In addition to the Principal Investigators, a research associate, four technicians and two graduate students will participate in field work, laboratory analysis, and data entry. After the field season, sample and data analysis will take place at the School of Fisheries and Ocean Sciences, University of Alaska-Fairbanks and the Juneau Center for Fisheries and Ocean Sciences, using available computers and established data management services. Geographic Information System (GIS) services will be needed from the Alaska Department of Natural Resources to prepare publication quality maps of the sites (Federal Fiscal year 1995).

F. Contracts

The primary contract for this project will be for the use of a research vessel able to support the field work in Herring Bay. The vessel must be able to meet all University safety requirements and be of sufficient size and configuration to meet the needs of the science specified above. Bid specifications will be drawn up and a request for proposals (RFP) will be sent out to prospective bidders. Proposals will be handled according to standard University procurement procedures. After inspection of the top ranking vessels, a final selection will be determined and an award made to the bidder with the lowest cost that has met all of the proposal requirements.

SCHEDULES

During the Summer of 1994 there will be four trips to Herring Bay of nine to fourteen days in duration. The first trip will be slightly longer than the rest, as over-winter experiments need to be checked and possibly re-established. The trips will occur during low tide cycles each month from June through September. The proposed schedule is as follows:

Oct.-Jan.	Prepare detailed study plans and Standard Operating Procedures (SOPs) for experiments and initiate procurement procedures for charter vessel
Feb.-May	Finalize SOP, sign charter contract
Mar.-May	Purchase/prepare field gear
June-Sep.	Field sampling period
Sep.-Oct.	Data analysis/interpretation
Nov.-Dec.	Report preparation/writing
Dec.	Submit draft report to ADF&G and Peer Reviewers
Jan.-Feb.	Submit final report 45 days after draft is returned

EXISTING AGENCY PROGRAM

None.

ENVIRONMENTAL COMPLIANCE/PERMIT/COORDINATION STATUS

The National Oceanic and Atmospheric Administration (NOAA) is lead federal agency for National Environmental Policy Act (NEPA) compliance for this project. This project meets NOAA agency requirements for Categorical Exclusion from the NEPA process.

Scientific collection permits will be obtained prior to the start of the field season from the Alaska Department of Fish and Game.

PERFORMANCE MONITORING

The Coordinating Principal Investigator, will be responsible for the overall completion of the proposed project. He will oversee the design of the experiments, data analysis, and the preparation of the final report. He will also be responsible for budget management, administering contracts, and coordinating the research efforts with the other investigators. The Co-Principal Investigator, along with other staff, will be responsible for drafting SOPS, establishing and monitoring experiments, analyzing data, and writing reports. Dr. Mark Johnson will be in charge of all data collection and analyses pertaining to the ADCP survey.

Quality control for counting organisms will occur through multiple counts on site.

Technicians are experienced in identifying algae and invertebrates in the field. Spot checks will occur throughout the season to monitor their accuracy. Database programs have been established to enter data from ongoing experiments since 1990. Statistical methods used to analyze the data have been reviewed by WEST, Inc., a statistical consulting firm sub-contracted during several past oil spill studies, including the Herring Bay project during 1990-1992. Data analysis procedures will retain as much continuity as possible with previous Herring Bay data, making it possible to make direct comparisons over time.

After the last field trip in September, the effort will shift toward the completion of all data analysis and interpretation and integration of results into a draft report to be submitted by December. A final report will be submitted 45 days after receiving comments from the peer reviewers. The final report will include complete documentation of the methods used for sampling and those used for data analysis, documentation on the location of sites, and summary findings for each of the specific study components. Relevant background information, discussions on methodologies, techniques, equipment, analyses, and interpretations of the results will also be included.

FY94 BUDGET ($K)

AGENCY	ADF&G
Personnel	10.1
Travel	0.0
Contractual	682.4
Commodities	0.0
Equipment	0.0
Capital Outlay	0.0
Sub-total	692.5
General Administration	36.9
TOTAL	729.4

NEPA COMPLIANCE

EXXON VALDEZ OIL SPILL PROJECT DESCRIPTION

Title: Mussel Bed Restoration and Monitoring

Project Number: 94090

Lead Agency: NOAA

Cooperating Agencies: ADEC, DOI-NPS

Project Cost, FY94: $332.9K ADEC

Project Startup Date: October 1993 **Duration:** 1 year

Geographic Area: Oil spill impacted areas of Prince William Sound, and Kenai and Alaska Peninsulas

PROJECT DESCRIPTION

The persistence of *Exxon Valdez* crude oil underlying some dense mussel (*Mytilus trossulus*) beds in Prince William Sound (PWS), began to cause concern among scientists and managers from state and federal agencies after exploratory field surveys in 1991. Field surveys were conducted 1992-1993 to establish the geographic extent and intensity of oiling of contaminated mussel beds by National Oceanic and Atmospheric Administration's (NOAA) Auke Bay Laboratory in PWS, and by DOI's National Park Service (NPS) along the Kenai and Alaska Peninsulas. NOAA also examined within-bed petroleum hydrocarbon (HC) distribution, conducted minimally intrusive site manipulation at three oiled beds in 1992, transplant tests in 1993, and tested mussels for effects of chronic exposure to HCs.

Results to date indicate: (1) persistence of oil under mussel beds continues, (2) mussels and sediments from oiled mussel beds continue to be the highest contamination sites in PWS, and (3) oiled mussels continue to be the most likely route of oil exposure to higher level predators.

In 1994, restoration of the oiled mussel beds will be initiated. Mussels will be temporarily removed, oiled sediments replaced, and mussels returned. Other methods of accomplishing reduction in HC levels will be considered. There will be continued monitoring of treated and untreated beds to document the differential rates of recovery.

A. Resources and/or Associated Services

The presence of substantial levels of petroleum hydrocarbons persisting under dense mussel beds in PWS and the Gulf of Alaska provides a continuing, potential source for HCs to enter the food chain, impacting higher consumers, i.e. harlequin ducks, oystercatchers, juvenile otters, and humans. There is a possible link in the presence of oiled mussels with

disrupted reproduction in harlequin ducks and increased mortality in oystercatcher chicks.

B. Objectives

1. To remove petroleum hydrocarbons from oiled mussel beds. This procedure may take multiple forms; the primary technique will be a mechanical process of removing oiled sediments and replacing them with clean sediments. (ADEC lead)

2. To measure recovery in levels of petroleum hydrocarbons in mussels and underlying sediments in oiled mussel beds in PWS, treated under Objective (A) and in those oiled beds for which treatment is not appropriate. (NOAA)

3. To measure recovery in levels of petroleum hydrocarbons in mussels and underlying sediments in oiled mussel beds along the Kenai and Alaska Peninsulas and in the Kodiak region. To document, quantitatively and qualitatively, the location, persistence, and weathering of oil from the spill outside PWS. (NPS)

4. To measure the physiological and reproductive injury in mussels chronically exposed to petroleum hydrocarbons. (NOAA)

C. Methods

Sediments and mussels are collected for hydrocarbon analyses from identified oiled mussel beds. Sampling methods and protocols have been developed and established which allow inter-year comparisons to detect changes in concentrations. Sediments are screened by ultraviolet fluorescence (UVF) to estimate total petroleum hydrocarbons. Mussels and selected sediments will then be analyzed by gas chromatography/mass spectroscopy (GC/MS) to measure individual aromatic and alkane analytes. These procedures have been developed by previously funded *Exxon Valdez* Restoration Projects.

Physical removal of oiled sediments is proposed for the cleaning portion of this study. Candidate sites will be identified from existing 1991-1993 hydrocarbon data. Additional selection criteria for this process will include density of mussels (and presence/absence and quantity of interspersed cobble and boulders), exposure of mussel beds to natural weathering processes, presence of other topographical features, and other parameters which would influence the success of this procedure at a particular site. The mussel layer will be (1) temporarily removed, (2) the underlying oiled sediments will be removed and dispersed, (3) clean sediments obtained from adjacent, clean areas will be placed in the void, and (4) the mussels will be returned (feasibility tests in 1993 indicates that mussels will reattach themselves to suitable substrate during the subsequent tidal cycle). HC levels in both sediments and mussels will be monitored.

To measure physiological and reproductive health of chronically exposed mussels, tests will

include measuring feeding rates, growth rates, reproductive indices, and evaluation of tissue abnormalities by histopathological examination.

D. Location

The entire oil spill impacted area.

E. Technical Support

Technical support will be provided by the lead and cooperating agencies.

F. Contracts

Helicopter and vessel charters, procured by standard agency procedures, will be necessary to conduct the field portions of this study. Field workers will be obtained through contracts with the local community.

SCHEDULES

October 1, 1993 - January 31, 1994
- UVF and GC/MS analyses of sediments/mussels collected 1993.
- Hydrocarbon data analyses
- Data compilation and analyses on biological parameters

January 31, 1994 - April 15, 1994
- Data analyses for chemical and biological parameters
- Interim report preparation.
- Preliminary planning for 1994 field season, including preparation of contracting materials

April 15, 1994 - June 1, 1994
- Field planning and selection of sites for cleaning

June 1, 1994 - August 31, 1994
- Field season for all objectives
- Planning for FY95 studies.

EXISTING AGENCY PROGRAM

Partial salaries for management of this study will be contributed by NOAA for the Auke Bay

Laboratory's (ABL) Restoration Program Leader and the Project Leader of this study; and for the Project Leader of the NPS portion - $30K and $10K, respectively. Wet lab and chemistry lab facilities at ABL will be involved at an estimated $50K over and above any reimbursement.

ENVIRONMENTAL COMPLIANCE/PERMIT/COORDINATION STATUS

Restoration of mussel beds will probably require an Environmental Assessment.

PERFORMANCE MONITORING

An interim report is scheduled for April 15, 1994. Periodic reports will be submitted as required. Several manuscripts are being prepared for publication in the *Exxon Valdez* Symposium proceedings.

FY94 BUDGET ($K)

AGENCY	NOAA	ADEC MARK WILL FILL IN	TOTAL
Personnel	181.1		181.1
Travel	28.3		28.3
Contractual	12.0		12.0
Commodities	74.2		74.2
Equipment	0.0		0.0
Capital Outlay	0.0		0.0
Sub-total	295.6	0.0	295.6
General Administration	28		28.0
TOTAL	323.6	0	323.6

NEPA COMPLIANCE

EXXON VALDEZ OIL SPILL PROJECT DESCRIPTION

Title: Killer Whale Recovery Monitoring

Project Number: 94092

Lead Agency: NOAA

Cooperating Agency: None

Cost of Project, FY94: $163.1K **Cost of Project, FY95:** $171.2K

Project Startup Date: October 1993 **Duration:** 1 year

Geographic Area: Prince William Sound

INTRODUCTION

The killer whale (*Orcinus orca*) inhabit all oceans of the world. Population estimates, based on photo-identification studies, are available for four North Pacific regions, and these are: inland waterways of Washington, British Columbia, southeast Alaska, and Prince William Sound (PWS). Current killer whale population estimates for PWS are 11 resident pods, representing 245 whales, and eight transient pods, representing 52 whales. Of these killer whale pods, AB pod is the most often encountered pod in PWS. AB pod, had 36 whales when last sighted before the spill in September 1988. When sighted on March 31, 1989, seven days after the spill, seven individuals were missing. Six additional whales were missing from AB pod in 1990. A killer whale monitoring project in 1993 will determine recovery of AB pod through the summer of 1993. The proposed project will monitor the continued recovery of AB pod.

PROJECT DESCRIPTION

A. Resources and/or Associated Services

Killer whales, recreation, tourism.

B. Objectives

The purpose of this study is to obtain photographs of individual killer whales in AB pod and to document natural recovery. Photographs collected will be compared to the National Marine Mammal Laboratory's (NMML) photographic database for the years 1989 to 1991 to determine if changes continue to occur in whale abundance,

pod integrity, mortality and natality rates. Individual objectives are as follows:

1. Count the number and individually identify killer whales within AB pod.
2. Identify changes in pod structure and integrity.
3. Determine killer whale reproductive rates and trends in abundance for AB pod within PWS.

C. Methods

1. Field studies will be conducted by NOAA and contract personnel who have recognized expertise in the study areas of concern. A shore-based camp, equipped with a suitable small boat for whale identification work, will be used in PWS to conduct photo-identification studies on killer whales from July to September 1994. Study areas will be similar to those worked when assessing injury to killer whales from 1989 through 1991 and 1993. The camp will be fully self-contained with necessary items for safety and staffed by at least two biologists. For consistency in data collection, key personnel remain in the field throughout the study period. Weather permitting, field personnel will spend an average of 8 to 10 hours per day conducting boat surveys searching for AB pod. When encountered, other pods of killer whales should be photographed as well. Specific areas, known for whale concentrations, are investigated first. However, if reports of whales are received from other sources, those areas are examined. If AB pod is not located in "known" areas and opportunistic sighting reports are not available; a general search pattern is developed and implemented. Travel routes typically taken by AB pod will be surveyed. When whales are sighted, researchers stop further search efforts and approach the whales to collect photo-identification information. When whales are encountered, researchers select a vessel course and speed to approximate the animals' course and speed to facilitate optimal photographic positioning.

2. Association patterns of individual whales/maternal subgroups will be examined to evaluate the current social structure of AB pod. Whale association patterns will be compared to the four-year database available at NMML (1989-1991 and 1993) to determine if changes have occurred in AB pod structure and integrity.

3. Mortality (number of missing whales) and natality (number of births) will be calculated from the 1994 season through photo-identification studies. The 1994 vital rates will be compared to NOAA's historical database on PWS killer whales to determine trends in abundance.

D. Location

This project will concentrate in western PWS. Support services (food and lodging) will most likely be sought from Chenega.

E. Technical Support

None.

F. Contracts

The vessel charter, technical support (photography), and support services (food and lodging) will be contracted.

SCHEDULES

1 Apr 1994	Contract negotiation
1 Jun 1994	Select contractor
15 Jul 1994 to 15 Sep 1994	Field research
30 Dec 1994	Draft report
15 Feb 1995	Final report

EXISTING AGENCY PROGRAM

No other NOAA projects exist for identifying killer whales in PWS.

ENVIRONMENTAL COMPLIANCE/PERMIT/COORDINATION STATUS

This is a field research project in which routine data collection will take place which is limited in context and intensity. Consequently, this project is categorically excluded from being required to provide an Environmental Impact Statement or Environmental Assessment. NOAA will serve as the lead in NEPA compliance.

Permits required by the Marine Mammal Protection Act will be obtained prior to the field season.

PERFORMANCE MONITORING

30 Dec 1994	Draft report
15 Feb 1995	Final report

FY94 BUDGET ($K)

AGENCY	NOAA
Personnel	29.3
Travel	0.0
Contractual	0.0
Commodities	0.0
Equipment	0.0
Capital Outlay	0.0
Sub-total	29.3
General Administration	4.4
TOTAL	33.7

NEPA COMPLIANCE

EXXON VALDEZ OIL SPILL PROJECT DESCRIPTION

Title: Assessment of Marbled Murrelet Prey and Foraging Habitat in Prince William Sound, Alaska, During the Breeding Season

Project Identification Number: 94102

Lead Agency: USFWS/ DOI

Cooperating Agencies:

Cost of Project, FY94: $237.2 **Cost of Project, FY95:** $55.2

Project Startup Date: 2/94 **Duration:** 1 year (Federal fiscal year)

Geographic Area: Prince William Sound, Alaska

Introduction

Marbled Murrelets (*Brachyramphus marmoratus*) are the most abundant seabird in Prince William Sound (PWS) in the summer, and they have declined significantly since the early 1970's. Although murrelets suffered high mortality in the *Exxon Valdez* oil spill, the spill cannot account for the 65% reduction in numbers observed in post-spill years. In other areas of its range, the marbled murrelet has declined due to the loss of old-growth forest nesting habitat, but a comparatively small proportion of potential nesting habitat has been harvested in PWS to date. Thus, the decline of murrelets in the Sound appears to be more complex, and may be food related. As the most abundant apex predator in the PWS marine ecosystem, the murrelet is an important indicator of the health of the marine environment. Additionally, recovery of the murrelet population will depend on the availability of forage fish such as sandlance, capelin, herring and pollock, and the accessibility of good foraging habitat near nesting areas. There is limited information on the prey species used by murrelets, but the spacial and temporal relationships between foraging and nesting habitats for murrelets are unknown.

Project Description

This project will use observations of individual murrelets to monitor the use of resources during the breeding season in PWS. We will identify prey species, locate foraging areas, determine foraging patterns from known nesting areas, and characterize important feeding habitat of murrelets. Individual murrelets will be followed by radiotelemetry, and supplementary data will be obtained by observations with binoculars and spotting scopes. The results will compliment other potential studies of forage fish abundance and distribution in relation to oceanographic characteristics. While forage fish studies increase our knowledge of prey species and their availability, they will not provide information on how

murrelets use the forage fish resource and what defines prey availability for murrelets during nesting and chick rearing. This project will identify the relationship between murrelet nesting and foraging areas and determine if murrelets are selecting specific types of marine habitats for foraging.

A. Resources and/or Associated Services

The resource addressed in this study is the marbled murrelet (*Brachyramphus marmoratus*) and the forage fish and marine habitats they depend on.

B. Objectives

1. Determine prey types used by murrelets during the breeding season in PWS.

2. Determine the foraging range and patterns of dispersal from nesting areas for murrelets in PWS.

3. Characterize foraging habitats used by individual murrelets during the breeding season.

C. Methods

Prey species will be identified by observations of foraging murrelets on the water using spotting scopes and binoculars. Capture and radio-tagging techniques used successfully in the 1993 murrelet restoration pilot study, will be used for the telemetry portion of the study. This project will be coordinated with other potential seabird foraging studies and the NMFS forage fish study.

Individually radio-tagged murrelets will be monitored between nesting and foraging areas. The 1993 pilot study, although a small sample size, has already provided some basic information on foraging distribution of murrelets in late summer. By starting the field season during incubation, individuals can be followed throughout incubation, chick rearing and post-fledging periods. At minimum, general nesting locations will be identified and the foraging distances mapped by following birds from boats and aircraft. Where possible, detailed observations will be made of their foraging site, such as distance from shore, water temperature, turbidity, salinity, currents, and presence of prey species (using hydroacoustic equipment). The foraging locations will be digitized to a GIS and overlaid with bathymetric and other available oceanographic data to define general characteristics of foraging areas. Foraging behavior of the murrelet, such as length of foraging bout, dive times and success rate will also be measured.

D. Location

The primary study areas in PWS will be selected from previously used study areas with known nesting sites and where murrelets have been successfully captured. These sites

include Unakwik Inlet, Naked Island, and Knight Island. Potential sites may also be selected from areas where other seabird studies or forage fish studies are to be conducted, such as Icy Bay and Orca Inlet.

5. Technical Support

MBM/GIS mapping support and AFWRC assistance will be used in identification of prey species and training in interpretation of sonar data..

6. Contracts

The capture and radio-tagging of murrelets will be contracted to qualified professionals, and will include the support vessel required for this portion of the project. Prey samples may be identified and measured under contract to the University of Alaska or other private consultant. A portion of warehouse rental fees will be covered by this project for equipment storage and preparation.

SCHEDULES

Fiscal 1994

April-May	Contracting, hiring of biotechnicians, safety training, boat and data collection equipment preparation, field training.
June	Capture and radio-tagging of murrelets, tracking by air and boat.
July-Aug	Continue tracking of murrelets by air and boat. Detailed observations of foraging murrelets, collection of prey samples.
Sept	Data entry and analysis of prey samples, digitizing of locations of radio-tagged murrelets.

Fiscal 1995

Oct-Dec	Analysis and report writing.
Jan	Draft report.
March	Final report.

EXISTING AGENCY PROGRAM

There is no existing program within the USFWS or NMFS to monitor forage fish or murrelet foraging requirements in PWS.

ENVIRONMENTAL COMPLIANCE/PERMIT/COORDINATION STATUS

The radio-tagging portion of this study is designed to minimize the potential for accidental death of the birds during handling, and the birds will be released unharmed. As a scientific study, it is categorically excluded from the requirements of NEPA, in accordance with CEQ regulation 40 CFR 1508.4.

PERFORMANCE MONITORING

Personnel will be trained to identify both *Brachyramphus* species and juveniles using photographs, study skins, and training sessions in the field. Training sessions will also be given for conducting at-sea counts and the identification of fish (held by murrelets on the water) using spotting scopes. The murrelet capture and radio-tagging personnel will be in continuous contact with the principal investigator to monitor their methods, success rate and advise on plans. All data will be entered into a computer database and archived at USFWS. Reports will be peer reviewed.

FY94 BUDGET ($K)

AGENCY	USFWS
Personnel	119.3
Travel	4.0
Contractual	71.8
Commodities	10.3
Equipment	8.0
Capital Outlay	0.0
Sub-total	213.4
General Administration	18.1
TOTAL	231.5
NEPA COMPLIANCE	0.0

EXXON VALDEZ OIL SPILL PROJECT DESCRIPTION

Title: Comprehensive Habitat Protection Process

Project Number: 94110

Lead Agency: ADNR

Cooperating Agencies: ADF&G, DOI-FWS, USFS

Cost of Project, FY94: $678.7K **Cost of Project, FY95:** $0.0K

Project Startup Date: October 1993 **Duration:** 1 year

Geographic Area: Prince William Sound, Gulf of Alaska

INTRODUCTION

This project is a continuation of the Comprehensive Habitat Protection Process. The objective of habitat protection is to identify and protect essential wildlife and fisheries habitats and associated services injured by the *Exxon Valdez* oil spill. Protection of these habitats prevents additional injury to these resources and services supported by them while recovery is taking place. Habitat Protection is a significant and integral part of restoration.

The Comprehensive Habitat Protection Process was initially approved in July 1992, and has since received strong support from both the public and the Trustee Council. The Imminent Threat phase of the comprehensive process was completed in February 1993, with the acquisition of lands in Kachemak Bay and Seal Bay. The Large Parcel Evaluation and Ranking methodology was approved in February 1993, and the initial evaluation and ranking of 81 parcels was completed and approved by the Trustee Council on November 30, 1993.

The continuation of the Comprehensive Habitat Protection Process involves evaluation of additional large parcels, a comparative benefits analysis, development and implementation of the small parcel evaluation and ranking process. These products will also be used to provide secondary evaluations during negotiations.

PROJECT DESCRIPTION

This project will provide the logistical and technical support necessary for the Habitat Work Force (HWF) to identify and assess the upland and nearshore habitats of the linked resources and services injured by the oil spill. The chief objective of this 1994 project is to complete the Comprehensive Habitat Protection Analysis. Tasks involve additional large parcel evaluations; development and implementation of a small parcel process; and development of a comparative benefits analysis for large parcels. Products generated in the project will be used to support parcel negotiations.

- Large Parcel Evaluations: Provide analysis for newly nominated lands (greater than 1000 acres) that have been submitted subsequent to Trustee Council approval of the Large Parcel Evaluation and Ranking Process on November 30, 1993.

- Small Parcel Process: Develop a methodology for processing, evaluating and ranking small parcels. The objective of the process to provide a standardized method for determining the relative benefit of small parcels to restoration. This process complements the Large Parcel Evaluation and Ranking by considering restoration benefits of parcels less than 1000 acres.

- Comparative Benefits Analysis: Develop a comparative analysis of large parcels using resource and service values (parcel score), acreage and cost, to facilitate the selection of those parcels for acquisition that result in the greatest benefit at the lowest cost. This tool will be used to assist negotiators in optimizing and maximizing the use of limited restoration funds.

A. Resources and/or Associated Services

The affected injured resources and associated services are listed below. Habitat protection objectives and benefits for each of these resources and services would differ depending on the particular parcel and the options acquired; however, general objectives and benefits are outlined below.

Pink salmon, sockeye salmon, cutthroat trout, Dolly Varden, herring: Ensure maintenance of adequate water quality, riparian habitat and intertidal habitat for spawning and rearing.

Bald eagle: Ensure maintenance of adequate nesting habitat and reduce disturbance in feeding and roosting areas.

Black oystercatcher: Reduce disturbance to feeding and nesting sites.

Common murre: Reduce disturbance in nearshore feeding areas and near nesting colonies.

Harbor seal and sea otters: Reduce disturbance at haul-out sites, pupping sites, and in nearshore feeding areas.

Harlequin duck: Ensure maintenance of adequate riparian habitat for nesting and brood rearing, and reduce disturbance to nearshore feeding, molting, and brood-rearing habitats.

Intertidal/subtidal biota: Maintain water quality along shorelines and reduce disturbance in nearshore areas.

Marbled murrelet: Ensure maintenance of adequate nesting habitat and reduce disturbance to nearshore feeding and broodrearing habitats.

River otter: Ensure maintenance of adequate riparian and shoreline habitats for feeding and denning.

Recreation: Maintain or enhance public access for recreational opportunities, and reduce disturbances that would create visual impacts.

Wilderness: Maintain wilderness qualities, and reduce impacts to wilderness qualities.

Cultural resources: Maintain or reduce disturbance to cultural resource sites.

Subsistence: Ensure subsistence opportunities in known harvest areas.

B. Objectives

1. Evaluation, restoration unit design, scoring and ranking of selected large parcels (ADFG, ADNR, USFS, FWS).

2. Design and implementation of small parcel evaluation methodology (ADFG, ADNR, USFS, FWS).

3. Data collection, interpretation, sorting, management, programming, and mapping (ADNR & ADFG).

4. Site inspections and evaluation of protection options (project specific) (ADFG, ADNR, USFS, FWS).

5. Development of comprehensive analysis document, including large and small parcel evaluations and ranking, and comparative benefits analysis to the Trustee Council (ADFG, ADNR, USFS, FWS).

6. Provide products in support of parcel negotiations (ADFG, ADNR, USFS, FWS).

C. Methods

Existing data and data obtained by Habitat Protection Work Group in 1993 will be analyzed to fill data gaps to the maximum extent possible. This will include some additional programming, database management, and GIS work to sort data and to map resource information where appropriate. Document and project tracking databases will be designed to handle raw data and specific project information.

Site reconnaissance visits and on-site option evaluations will be conducted as necessary by the Habitat Work Force using standard evaluation formats developed by this group. Travel will be done via air charters.

Documentation and final report preparation will be accomplished by Habitat Work Force staff. Final products may be sent out to a printer on an as needed basis

D. Location

The analysis will cover all nominated lands within the oil spill zone. These lands are located within Prince William Sound, Kenai Peninsula, Kodiak/Afognak Archipelago and on the Alaska Peninsula.

E. Technical Support

Technical support is needed from the Restoration Office to catalog and manage documents required by this project and acquire documents related to this project.

Alaska Department of Natural Resources will provide computer support for programming and data management.

F. Contracts

Reimbursable services agreements will be issued to divisions of participating agencies and private contractors to provide services specified under technical support.

SCHEDULES

Evaluation and ranking of additional large parcels and small parcels will be completed during FY94 as part of the continuing Comprehensive Habitat Protection Process. The comparative benefits analysis and ongoing negotiation support will continue throughout FY94.

EXISTING AGENCY PROGRAM

During FY94, the federal and state agencies involved in this project will contribute to the project information and expertise associated with normal operations. This project will synthesize this information and develop an effective knowledge base specific to the goals and needs of habitat protection and the comprehensive parcel evaluation.

ENVIRONMENTAL COMPLIANCE/PERMIT/COORDINATION STATUS

Environmental documentation will need to be conducted on a project/parcel specific basis as the Trustee Council approves proceeding with negotiations.

PERFORMANCE MONITORING

1. Computer databases easily accessible with resource information for lands within the spill zone.

2. Cataloged and organized library containing all resource documents required by this project.

3. Color maps depicting restoration units and surrounding lands.

4. Comprehensive analysis documents for all available lands within the spill zone.

FY94 BUDGET ($K)

AGENCY	ADNR	ADF&G	USFS	FWS	TOTAL
Personnel	109.5	69.9	36.8	33.5	249.7
Travel	9.2	4.6	4.5	4.6	22.9
Contractual	290.1	34.5	4.5	4.5	333.6
Commodities	4.2	5.5	0.5	0.5	10.7
Equipment	1.0	0.0	0.0	0.0	1.0
Capital Outlay	0.0	0.0	0.0	0.0	0.0
Sub-total	414.0	114.5	46.3	43.1	617.9
General Administration	36.7	12.9	5.8	5.3	60.8
TOTAL	450.7	127.4	52.1	48.4	678.7
NEPA Compliance	0.0				

EXXON VALDEZ OIL SPILL PROJECT DESCRIPTION

Title: Habitat Protection and Acquisition Fund

Project Number: 94126

Lead Agency: ADNR

Cooperating Agencies: ADF&G, USFS, DOI-FWS, DOI-NPS

Cost of Project, FY94: $1,064.5K **Cost of Project, FY95:** $TBD

Project Startup Date: October 1993 **Duration:** 1 year

Geographic Area: Prince William Sound, Kodiak Island Borough, and Alaska Peninsula

INTRODUCTION

The objective of habitat protection is to identify and protect essential wildlife and fisheries habitats and associated services injured by the *Exxon Valdez* oil spill. Protection of these habitats, prevents additional injury to the resources and services while recovery is taking place.

In 1993 the Restoration Team's Habitat Work Force (formerly the Habitat Protection Work Group) conducted a survey and assessment of selected parcels of private land within the oil spill zone. The lands were evaluated, ranked and mapped using the Trustee Council approved Interim Evaluation Process to determine the value of these areas to injured resources and services, and the benefits that could be achieved through habitat protection. Following that ranking the Trustee Council started negotiations on several parcels to provide habitat protection. Successful negotiations were conducted with owners of inholdings within Kachemak Bay State Park and on northern Afognak Island. The Large Parcel Evaluation and Ranking methodology was approved in February 1993, and the initial evaluation and ranking of 81 parcels was completed and approved by the Trustee Council on November 30, 1993. The Habitat Work Force will provide continuing support to negotiators during secondary evaluations using products developed in the Comprehensive Habitat Protection Process.

PROJECT DESCRIPTION

The purpose of this project is to facilitate the purchase of habitat protection rights by the Trustee Council. In addition, this project will provide information necessary to develop post-acquisition management recommendations consistent with restoration objectives for the acquired interest in a particular parcel. Site inspections may be necessary during the final negotiation process and also during the development of post-acquisition management recommendations.

A. Resources and/or Associated Services

The affected injured resources and associated services are listed below. Habitat protection objectives and benefits for each of these resources and services would differ depending on the particular parcel and the options acquired, however, general objectives and benefits are outlined below.

Pink salmon, sockeye salmon, cutthroat trout, Dolly Varden, herring: Ensure maintenance of adequate water quality, riparian habitat and intertidal habitat for spawning and rearing.

Bald eagle: Ensure maintenance of adequate nesting habitat and reduce disturbance in feeding and roosting areas.

Black oystercatcher: Reduce disturbance to feeding and nesting sites.

Common murre: Reduce disturbance in nearshore feeding water and near nesting colonies.

Harbor seal and sea otters: Reduce disturbance at haul-out sites, pupping sites, and in nearshore feeding areas.

Harlequin duck: Ensure maintenance of adequate riparian habitat for nesting and brood rearing and reduce disturbance to nearshore feeding, molting, and brood-rearing habitats.

Intertidal/subtidal biota: Maintain water quality along shoreline and reduce disturbance in nearshore areas.

Marbled murrelet: Ensure maintenance of adequate nesting habitat and reduce disturbance to nearshore feeding and broodrearing habitats.

River otter: Ensure maintenance of adequate riparian and shoreline habitats for feeding and denning.

Recreation: Maintain or enhance public access for recreational opportunities, reduce disturbances that would create visual impacts.

Wilderness: Maintain wilderness qualities, reduce impacts to wilderness qualities.

Cultural resources: Maintain or reduce disturbance to cultural resource sites.

Subsistence: Ensure subsistence opportunities in known harvest areas.

B. Objectives

The Habitat Protection and Acquisition Fund Project will be used for acquiring lands or partial interests in lands that contain habitats linked to resources and/or services injured by the oil spill. The Trustee Council will consider purchasing habitat protection rights using the following tools: fee acquisition, conservation easements, acquisition of partial interests, cooperative management agreements, and others.

C. Methods

Funds from this project will be used to acquire full title or partial interests in lands, subject to approval by the Trustee Council, that contain habitats linked to resources and services that were injured by the *Exxon Valdez* oil spill. Acquisition of lands or interests in lands will be accomplished according to accepted realty principles and practices. Technical support to negotiators will be provided by the Habitat Work Force using products developed in the Comprehensive Habitat Evaluation Process and Project 94110. All acquisitions will require title evidence, appraisals of fair market value, litigation reports, hazardous substances surveys, legal review of title, and negotiations. Some acquisitions may require land surveys and additional ecological surveys. Post-acquisition management surveys will be conducted by the Habitat Work Force using standard evaluation formats developed by this group. Travel will be done via air and boat charters to be determined on a site-specific basis. This fund allows for expenditure of funds for the activities noted above, once a specific parcel has been approved for acquisition/protection by the Trustee Council. Following purchase, acquired parcels (or interest in parcel) will be managed by the appropriate resource agency in a manner that is consistent with the restoration of the affected resources and/or services. The Trustee Council will decide which agency will manage the land or may create a new management authority.

D. Location

The analysis will cover all selected lands within the oil spill zone. Lands are located within Prince William Sound, Kodiak/Afognak Archipelago and on the Alaska and Kenai Peninsulas.

E. Technical Support

Appropriate federal agencies and the Alaska Department of Natural Resources will provide support for title searches, appraisals, and hazardous substances surveys.

F. Contracts

Contracted support is expected for appraisals of fair market value, litigation reports, legal title reviews and other contracts deemed necessary by the Trustee Council.

SCHEDULES

Dependent upon negotiations with landowners.

EXISTING AGENCY PROGRAM

Habitat Protection - Acquisition Fund activities will coordinate with and consider ongoing agency activities whenever possible.

ENVIRONMENTAL COMPLIANCE/PERMIT/COORDINATION STATUS

Environmental documentation will need to be conducted on a project/parcel-specific basis as the Trustee Council approves proceeding with negotiations.

PERFORMANCE MONITORING

Performance monitoring procedures are currently being developed.

FY94 BUDGET ($K)

AGENCY	ADNR	ADF&G	USFS	USFWS	TOTAL
Personnel	25.2	9.0	37.4	134.1	205.7
Travel	18.0	0.0	33.0	27.7	78.7
Contractual	240.0	0.0	400.0	20.0	660.0
Commodities	0.0	0.0	0.0	0.5	0.5
Equipment	0.0	0.0	0.0	50.0	50.0
Capital Outlay	0.0	0.0	0.0	0.0	0.0
Sub-total	283.2	9.0	470.4	232.3	994.9
General Administration	20.6	1.4	26.1	21.5	69.6
TOTAL	303.8	10.4	496.5	253.8	1064.5
NEPA Compliance	To be determined				

* The dollar amount for FFY 94 capital outlay and FFY 95 costs are to be determined (TBD) based on Trustee Council actions.

EXXON VALDEZ OIL SPILL PROJECT DESCRIPTION

Title: Stock Identification of Chum and Sockeye Salmon in Prince William Sound

Project Number: 94137

Lead Agency: ADF&G

Cooperating Agency: None

Project Cost, FY94: $214 9K ADF&G

Project Startup Date: October 1993 **Duration:** 2 Years

Geographic Area: Prince William Sound

INTRODUCTION

Recent wild stock salmon production (exclusive of pink salmon) in Prince William Sound (PWS) ranged from 800,000 to 900,000 chum salmon, 300,000 to 500,000 sockeye salmon and 10,000 to 20,000 coho and chinook salmon. Up to 75% of wild pink and chum salmon spawn in intertidal areas, with the greatest proportion of intertidal spawning occurring in streams flowing into the southwestern portion of PWS. Oil from the *Exxon Valdez* oil spill was deposited in intertidal spawning areas used by pink and chum salmon and may have adversely affected spawning success and early marine survival for these species. Also, emergent fry and smolt of all salmon species from throughout PWS migrated through and reared in areas contaminated by oil. The suite of injuries already identified led to a decline in the size and overall well-being of wild pink salmon populations. These effects may persist for several years. Adult returns and tag recoveries for sockeye, chum, and chinook which return at older ages are not complete, and the full extent of injury to these species is not yet known.

Salmon stocks impacted by the spill are heavily exploited in commercial, sport, and subsistence fisheries. Their restoration can most effectively be achieved through more sensitive management of the commercial fishery. The injured populations exist in fisheries dominated by hatchery and wild stocks from unaffected areas of the Sound. The management of this mixed stock fishery has historically been based on maintaining good temporal and spatial distribution of spawning escapement for groups of stocks in eight major fishing districts. The success of this management effort relies upon the manager's ability to control stock specific exploitation rates. Restoration based on such a management strategy will require even more accurate inseason catch stock composition estimates if lower harvest rates are to be achieved for injured wild stocks versus unimpacted wild stocks or hatchery stocks.

The foundations for this project were firmly established in feasibility studies begun in 1986

and extending through 1988. During the damage assessment process for the spill, large scale tagging and recovery projects were instituted and perfected under Natural Resources Damage Assessment (NRDA) Fish/Shellfish (F/S) Study #3. Damage assessment funds were expended for tagging hatchery releases of sockeye, coho, and chinook salmon in 1989 and 1990 and releases of chum salmon in 1990. Tag recovery efforts for wild and hatchery salmon were funded by damage assessment funds in 1989, 1990, and 1991 and by restoration funds in 1993.

PROJECT DESCRIPTION

This project is designed to provide estimates of hatchery and wild fish contributions to commercial and cost recovery fisheries in PWS by recovering coded wire tags from all salmon species other than pink salmon. These estimates will allow fisheries managers to monitor the size and health of wild salmon populations and lessen interceptions of wild fish in mixed stock fisheries, thus helping wild stocks to recover more quickly. The project will be administered and supervised by the Alaska Department of Fish and Game (ADF&G).

A. Resources and/or Associated Services

Sockeye salmon *Oncorhyncus nerka*, chum salmon *O. keta*, chinook salmon *O. tshawytscha*, and coho salmon *O. kisutch* in Prince William Sound, Alaska and the commercial, subsistence and sports fisheries they support would benefit from this study. The contribution estimates will allow fisheries managers to lessen interceptions of wild fish in mixed stock fisheries and to achieve desired escapement levels of wild salmon.

B. Objectives

1. Sample 25% of the sockeye, chum, chinook and coho salmon catches from commercial and cost recovery fisheries in PWS for coded wire tags.

2. Sample approximately 95% of the hatchery sockeye, chum, chinook and coho salmon brood stock in PWS for coded-wire tags.

3. Make inseason estimates of the temporal and spatial contributions of tagged hatchery stocks of sockeye, chum, chinook and coho salmon to PWS commercial and hatchery harvests based on the number of tags detected in adipose-clipped fish recovered during catch sampling.

4. Provide timely inseason estimates of hatchery and wild stock contributions to harvests by time and area to fisheries managers so they can closely regulate exploitation of injured wild stocks.

5. Use data from decoded tags recovered from commercial catches, cost recovery harvests, and hatchery brood stock to verify or adjust inseason contribution

estimates

6. Estimate marine survival rates for each uniquely coded hatchery release group where possible.

C. Methods

Tag recoveries will be made from a stratified random sample. Fisheries will be stratified by district, discrete time segments and processor. For each stratum, 25% of the sockeye, chum, chinook and coho salmon commercial harvest and cost recovery harvest will be scanned for fish with a missing adipose fin. Catch sampling will be conducted in processing plants located in Cordova, Valdez, Anchorage and Whittier. Broodstock sampling will also occur at 3 PWS hatcheries. A minimum of 50% of the daily broodstock requirements at each hatchery will be scanned for fish with missing adipose fins.

In the catch, cost recovery and broodstock samples, the total number of fish scanned and the total number of fish with missing adipose fins will be recorded. The heads will be removed from fish with missing adipose fins. Each head will be tagged with uniquely numbered strap tags. Recovered heads will be shipped to the Tag Lab in Juneau for decoding and data posting. The information will then be sent to Cordova for data analysis.

D. Location

Sampling of salmon catches from commercial and cost recovery fisheries will occur in shore- based processing plants in Cordova, Valdez, Whittier, and Anchorage. There will also be sampling in Seward, Kenai, and aboard floating processors if significant numbers of PWS salmon are processed at those locations. Extraction and decoding of tags will be accomplished by the ADF&G coded wire tag lab in Juneau. All data analyses will be completed in Cordova with assistance from Anchorage-based ADF&G biometrics staff.

E. Technical Support

ADF&G will supply biometrics support to ensure that project methods and data analyses will provide inseason stock contribution estimates at levels of accuracy and precision required for management of wild stocks in PWS.

F. Contracts

Air charter and vehicle rental contracts will be needed for this project. ADF&G will administer and supervise the project.

SCHEDULES

Dates	Activity
May 15-Sept 30, 1994	Tag recoveries in commercial fisheries, cost recovery harvests, and brood stocks. Inseason catch stock composition estimates by time and area for management of commercial and cost recovery fisheries.
November 30, 1994	Draft summary report
January 15, 1995	Final Report

Overall project design, supervision, coordination, data analyses, and reporting will be the responsibility of the ADF&G. They will supervise all the day-to-day project activities, complete inseason analyses for the ADF&G Area Management Biologist, and take the lead on all post season analyses and reporting. Biometrics support approval of project design and quality control procedures, review of all data analyses, and editorial support for project reports will be done by the ADF&G Anchorage Regional Office.

EXISTING AGENCY PROGRAM

Coded wire tags recovered by this project are applied by Prince William Sound Aquaculture Corporation and Valdez Fisheries Development Association at their expense. The annual cost of tag application by these private non-profit corporations is approximately $160,000.

ENVIRONMENTAL COMPLIANCE/PERMIT/COORDINATION STATUS

The National Oceanic and Atmospheric Administration (NOAA) is lead Federal agency for the National Environmental Policy Act (NEPA) compliance for this project. This project meets NOAA agency requirements for Categorical Exclusion from the NEPA process.

All sampling activities for this project occur within fish processing plants or fish hatcheries. No specific permits are required. ADF&G will coordinate with the Prince William Sound Aquaculture Corporation and Valdez Fisheries Development Association with respect to locating samplers in their respective fish hatcheries.

PERFORMANCE MONITORING

ADF&G will be responsible for all data collection, analyses, and report writing on this project. ADF&G is also responsible for integration of information from this project into their inseason fisheries management decisions. The ADF&G Principal Investigator will design the study, oversee data collection, and provide the ADF&G Area Management Biologist for salmon with inseason catch contribution estimates for hatchery and wild stocks and make recommendations about management actions required to reduce exploitation on injured wild

stocks.

Personnel policy, purchasing practices, field camp operations, safety procedures, and project administration will be in compliance the ADF&G Division of Commercial Fisheries Manual of Standard Operating Procedures (SOP). Data collection procedures are similar to those used in NRDA F/S Study #3. These procedures have been thoroughly reviewed by the NRDA peer review process and approved by the Restoration Team.

FY94 BUDGET ($K)

AGENCY	
Personnel	
Travel	
Contractual	
Commodities	
Equipment	
Capital Outlay	
Sub-total	
General Administration	
TOTAL	

NEPA COMPLIANCE

EXXON VALDEZ OIL SPILL PROJECT DESCRIPTION

Title: Anadromous Species Stock Restoration and Habitat Enhancement

Project Number: 94139/043

Lead Agency: USFS

Cooperating Agency: ADF&G

Cost of Project FY94: $455.3K

Project Startup Date: May 1994

Cost of Project, FY95: $202.2 **Duration:** 3 to 5 years

Geographic Area: PWS for cutthroat trout and Dolly Varden
PWS, Lower Cook Inlet, and Kodiak Island Area for salmon

INTRODUCTION:

Salmon:

The salmon instream habitat and stock restoration projects are the result of a three-year survey of the oil-spill impact area to identify appropriate and cost-effective instream habitat restoration techniques for salmon. Four projects have been identified in Prince William Sound and one project has been identified in both Lower Cook Inlet and Kodiak Island area. These projects are intended to replace damaged salmon spawning habitat by providing access to existing habitat or creating new habitat in areas where suitable groundwater resources exist. Projects by area are as follows.

Cutthroat Trout and Dolly Varden:

Cutthroat trout and Dolly Varden overwinter and spawn in freshwater, and utilize nearshore and estuarine habitat for feeding throughout their lives. The highest concentrations of petroleum hydrocarbon metabolites in bile of all fish sampled in 1989 were found in Dolly Varden. Tagging studies demonstrated that the annual mortality of adult Dolly Varden in oiled areas was greater than in unoiled areas. The larger cutthroat trout also showed higher levels of mortality in oiled than in unoiled areas. Of 143 streams surveyed in PWS in 1989, only 10 contained anadromous cutthroat trout. These fish have a limited home range and do not migrate over great expanses. These small populations are vulnerable to exploitation and habitat alterations.

PROJECT DESCRIPTION

1. Resources and/or Associated Services:

Six fish species will benefit including sockeye salmon, coho salmon, pink salmon, chum salmon, cutthroat trout and Dolly Varden. Commercial and sport fisheries will be improved.

Salmon:

Mile 6.5 Richardson Highway Spawning Channel:

The project at 6.5 mile Richardson Highway near Valdez will benefit pink, coho, and chum salmon. The spawning habitat created by the project will likely support 7,186 pink, 5,134 chum, and 822 coho salmon spawners. These species are utilized for sport fishing, viewing, and commercial fishing in the Valdez area. Recreational fishing, tourism, and the commercial fishing industry will benefit from this project.

Montague Island Chum Salmon Restoration:

Prior to the 1964 earthquake, Montague Island streams accounted for nearly 8% of the total chum salmon production in PWS. Habitat alterations caused by uplift combined with a number of environmental and man-induced factors, led to the virtual extirpation of chums on the island. Many of the historic chum salmon producing streams were moderately to lightly oiled by the Exxon Valdez oil spill. This project will reestablish chum salmon on Montague Island and rehabilitate 10 miles of stream habitat for fish and wildlife.

Otter Creek Barrier Bypass:

The project will provide access for all salmon, trout and Dolly Varden by designing and constructing a fish pass at the barrier falls on Otter Creek. Presently, there is an Alaska steep pass, built in 1982, on a barrier falls near the mouth that allows cutthroat trout access past the falls. A July 1991 monitoring trip by USFS indicated, however, that all fish would be unable to move past a small vertical falls above the steep pass. Additionally, there are two 1.5 m cascades that could be modified for easier passage to allow access to a 55 acre lake and a 3 acre pond.

Shrode Creek Barrier Bypass:

The Shrode Creek fishway was initially constructed in 1962 to bypass a 3m barrier falls and provide consistent access to Shrode Lake and two small unnamed lakes. These lakes are utilized by sockeye, coho, and pink salmon as well as cutthroat trout and Dolly Varden. Chum salmon are also present in the creek. A 1991 inspection indicated the need for immediate replacement of the gabion baskets as many salmon were impaled and gilled by the deteriorating gabions. The lower concrete wall is undercut by the

current and needs to be replaced.

Port Dick Spawning Channel:

The project at Port Dick on the outer Kenai Peninsula will benefit pink and chum salmon through creation of habitat that will support up to 1,500 spawners. This system was chosen because it is one of the most productive pink and chum salmon streams in the Lower Cook Inlet area, and it was moderately to heavily oiled by the EVOS.

Little Waterfall Creek Barrier Bypass:

The project at Little Waterfall Creek on Afognak Island will benefit pink and coho salmon by providing access to underutilized spawning habitat with a capacity for 24,000 spawners. Little Waterfall Bay was oiled by the EVOS.

Cutthroat Trout and Dolly Varden:

Habitat Improvement in Nine PWS Streams:

This project entails the use of approved instream habitat techniques to create or facilitate the creation of overhead cover, resting areas, spawning gravel, and rearing habitat. In addition, this project will protect streambanks and provide habitat for fish food organisms.

2. Objectives:

1. Construct several spawning channels and barrier bypasses in the oil-spill impact area.
2. On Montague Island, accelerate natural stream stabilization and promote healthy riparian forest.
3. Trap spawning gravel and provide rearing habitat
4. Provide escape areas and areas of lower velocity during high flows.
5. Conduct necessary project maintenance each year.
6. Monitor the success of the projects by estimating the numbers of fish utilizing the improved habitat and/or the number of fry produced each year.

3. Methods:

Salmon:

Mile 6.5 Richardson Highway Spawning Channel:

The project at 6.5 mile on the Richardson Highway will increase the amount of available spawning habitat through construction of five channels intersecting the existing stream channel. Each channel will be from 200 to 300 m in length and 4 m wide. Approximately 5,135 m^2 of spawning habitat will be created. Groundwater data from this site indicates that the quality of spawning habitat created will be very high.

Montague Island Chum Salmon Restoration:

Projects will include in-stream structure placement, various spawning and rearing habitat improvement structures, and development of riparian forest prescription. Riparian forest management will include tree planting and tree thinning of selected zones.

Otter Creek Barrier Bypass:

A fishpass will be designed and constructed to overcome a 1.5 m falls. Two 1.5 m cascades will also be modified for easier passage. The water level in a jump pool will be raised by means of gabions.

Shrode Creek Barrier Bypass:

Gabion baskets will be replaced and a new cement wall will be constructed.

Port Dick Spawning Channel:

The project at Port Dick on the outer Kenai Peninsula will increase the amount of available spawning habitat through construction of a spawning channel immediately above the high tide zone. The channel will be 150 m in length and 4 m wide. Approximately 600 m^2 of spawning habitat will be created. Fry will be planted in the channel to accelerate the rate of colonization.

Little Waterfall Creek Barrier Bypass:

The project at Little Waterfall Creek on Afognak Island will provide access to a significant amount of pink and coho spawning habitat above a migratory barrier. The existing barrier bypass structure at this site is not operating to its full potential. Barrier bypass improvements at Little Waterfall Creek will focus on construction and modification of the present bypass structure at the third upstream barrier. The bypass grade will be reduced by removing the existing concrete resting tanks and extending the bypass to lower the gradient. This will require adding a 9.1 m extension to the bypass, two resting tanks, and an entrance tank.

Cutthroat Trout and Dolly Varden:

Habitat Improvement in Nine PWS Streams:

This project entails the use of approved instream habitat techniques including: channel block, boulder placement, cover logs and root wads, tree cover, bank crib with cover log, log and bank shelter, single-wing and double wing deflectors, deflector and cover log, channel constrictors, cross logs and revetments, wedge dams. and K dams.

4. **Location:**

Area	Project Type	Location
Prince William Sound	spawning channels	tributary of the Lowe River near 6.5 mile on the Richardson Highway, NW of Valdez.
	instream structures & riparian management barrier bypass	streams located on the northeast and western shore Montague Island
	barrier bypass	Otter Creek, Bay of Isles, Knight Island
	barrier bypass	Shrode Creek, Long Bay, Culross Passage
	habitat improvement	Eshamy Creek and Lake Gumboot Creek Stream No. 508 Stream No. 509 Otter Creek and Lake Sockeye Creek and Lake Miners Creek and Lake Shrode Creek and Lake Rocky Creek
Lower Cook Inlet	spawning channel	Port Dick on the outer Kenai Peninsula
Kodiak Island area	barrier bypass	Little Waterfall Creek on Afognak Island

6. Contracts:

The construction of some projects will be contracted to private construction contractors. Project maintenance and evaluation will generally be conducted by agency staff.

SCHEDULES:

This project will involve construction and a subsequent two-year period of evaluation to determine the success of habitat improvement. The anticipated schedule of events for the first year of the project is described in Table 1.

Table 1: Anticipated schedule of events for proposed instream habitat enhancement projects.

		Area		
Activity	Time Period	PWS	LCI	KDK
Stream monitoring	11/93 - 6l94	X		
Groundwater monitoring	11/93 - 6l94	X	X	
Project construction	5l94 - 8l94	X	X	X
Plant eyed eggs	8l94 -1 1/94		X	
Estimate fish abundance & dist	8l94 -1 1/94	X		
Estimate spawner abundance	8l94 -1 1/94	X	X	X
Submit annual project report	4/95	X	X	X
Estimate egg-to-fry survival	3l95 - 5/95	X	X	X
Estimate fish abundance & dist	3/95 - 5l95	X		

EXISTING AGENCY PROGRAM:

Shrode Creek, Otter Creek and Little Waterfall Creek have existing fish passes. The Shrode Creek fishway was originally constructed in 1962 and was modified during 1965-1967. This fishway has required substantial maintenance since the 1980's. The Otter Creek steep pass was constructed in 1982. Little Waterfall Creek constructed in the late 1970's and early 1980's.

During 1987 through 1990, chum salmon fry were released at Chalmers River on Montague Island. Adult chum salmon have been observed in Chalmers River since 1990. Straying chum salmon have been observed in two other streams on the island.

There is no existing agency program for cutthroat trout and Dolly Varden.

ENVIRONMENTAL COMPLIANCE/PERMIT/COORDINATION STATUS

Project	Land Owner	NEPA Status
Spawning Channel at 6.5 Mile on the Richardson Highway	State land	EA required
Montague Island Chum Salmon Restoration	USFS land	EA required
Otter Creek Barrier Bypass and Otter Creek and Lake Habitat Improvement	USFS and CAC land within WSA	EA required
Shrode Creek Barrier Bypass	USFS land	categorical exclusion
Rocky Creek Habitat Improvement	USFS land	EA required
Eshamy Creek and Lake Habitat Chenega Improvement	Chenega Village Corp.	EA and coordination with land owner required
Otter Creek and Lake Habitat Improvement	USFS land within WSA	EA required
Sockeye Creek and Lake Habitat Improvement	CAC land within WSA	EA and coordination with land owner required
Miners Creek and Lake Habitat Improvement	USFS land within WSA	EA required
Shrode Creek and Lake Habitat Improvement	USFS land within WSA	EA required
Spawning Channel at Port Dick	State land	EA required
Barrier Bypass at Little Waterfall Creek	Koniag Regional Corp. land	categorical exclusion

PERFORMANCE MONITORING

Salmon:

Mile 6.5 Richardson Highway Spawning Channel:

The number of spawners and fry will be counted each year. Out migrating fry will also be coded-wire tagged to allow estimation of total adult production from the project.

Montague Island Chum Salmon Restoration:

The total number and distribution of chum salmon spawners will be estimated.

Otter Creek Barrier Bypass:

Salmon, trout and Dolly Varden utilizing the steep pass will be monitored.

Shrode Creek Barrier Bypass:

Migrating salmon, trout and Dolly Varden will be observed at the fish pass to gauge ease of access.

Port Dick Spawning Channel:

Spawners utilizing the channel will be enumerated and egg-to-alevin survival in the channel will be estimated, annually.

Little Waterfall Creek Barrier Bypass:

The number of spawners utilizing habitat above the barrier will be counted and the egg-to-alevin survival will be estimated, annually.

Cutthroat Trout and Dolly Varden:

Habitat Improvement in Nine PWS Streams:

The number and distribution of cutthroat trout and Dolly Varden will be monitored in the study areas and a report will be submitted to the Trustees.

All Projects:

An annual report submitted in April, 1995 will detail the number of spawners utilizing each project during 1994. Reports submitted in subsequent years will detail egg-to-alevin survival and estimated adult production from each project.

FY94 BUDGET ($K)

AGENCY	USFS	ADF&G	TOTAL
Personnel	96.3	58.5	154.8
Travel	11.2	12.0	23.2
Contractual	32.5	258.9	291.4
Commodities	34.9	3.9	38.8
Equipment	14.9	2.0	16.9
Capital Outlay	0.0	0.0	0.0
Sub-total	189.8	335.3	525.1
General Administration	16.6	28.8	45.4
TOTAL	206.4	364.1	570.5
NEPA COMPLIANCE	$6.5	$3.0	$9.5

EXXON VALDEZ OIL SPILL PROJECT DESCRIPTION

Title: Surveys to Monitor Marine Bird and Sea Otter Populations in Prince William Sound during Summer and Winter

Project Identification Number: 94159

Lead Agency: DOI-FWS

Cooperating Agency: None

Cost of Project, FY94: $286.9K **Cost of Project, FY95:** $43.3K

Project Startup Date: January 1994 **Duration:** 1.25 years

Geographic Area: Prince William Sound

INTRODUCTION

The waters and shorelines of Prince William Sound (PWS) support abundant marine bird and sea otter (*Enhydra lutris*) populations throughout the year. Potential injuries to marine birds from exposure to the *Exxon Valdez* oil spill included, but were not limited to, death, changes in behavior, and decreased productivity. Post-spill surveys, identical to this proposal, suggested that the population abundance of sea otters and several marine bird species declined as a result of the spill. Nearly 30,000 bird and 900 sea otter carcasses were recovered following the spill. Of these totals, 3,400 bird and 490 sea otter carcasses were from PWS. Based on modeling studies using carcass search effort and population data, an estimated 375,000 - 435,000 marine birds were killed in PWS and the northern Gulf of Alaska by the oil spill. The majority of these birds were murres. The number of sea otters killed in PWS by the spill was estimated to be 2,800 otters. These estimates maybe low because they only include direct mortality occurring in the first five months after the spill and do not include chronic effects or loss of reproductive output.

The USFWS conducted boat surveys of marine bird and sea otter populations in PWS in 1972-73, 1984-85, and several years following the spill (1989, 1990, 1991 and 1993). These surveys documented overall declines in several PWS marine bird populations between the early 1970s and the years after the spill. Declining species or species groups were cormorants, scoters, black oystercatcher, scaup, glaucous-winged gull, black-legged kittiwake, Arctic tern, pigeon guillemot, marbled murrelets, Kittlitz's murrelets, and northwestern crow. Differences were also detected between the oiled area and the non-oiled areas. Nine species or groups (cormorants, harlequin duck, black oystercatcher, pigeon guillemot, northwestern crow, loons, mew gull, Arctic tern, and scoters) declined more in the oiled area. Specific studies of three of these species (i.e. harlequin duck, black oystercatcher, and pigeon guillemot) corroborated the population changes found by the boat surveys. Burn, using data from the boat surveys, documented

declines in sea otter density and abundance in shoreline habitats of PWS following the spill. He also detected a continuing pattern of significantly lower sea otter densities in oiled coastal areas, suggesting that mortality in or displacement of sea otters from these areas occurred.

Monte Carlo simulations using these data examined the estimated power of the abundance estimates. The simulations showed that power increased substantially for simulated sampling regimes in which data were collected every year rather than every other year over a 9-year period.

This project has several benefits. Restoration of marine bird and sea otter populations requires population estimates to determine whether recovery is occurring or if declines are continuing. This project will benefit marine birds and sea otters by revealing species that show continuing injury due to the spill; this information is necessary to plan meaningful restoration actions.

This project will also provide valuable information on the distribution and habitat use of these species. Survey data from this project have been used for these purposes by investigators of other studies on harlequin ducks, marbled murrelets, black oystercatchers, and sea otters. Survey methods are flexible enough to provide for collection of more detailed information, such as age class data, if such information is requested by other investigators.

PROJECT DESCRIPTION

A. Resources and/or Associated Services:

The resources to be studied are marine and coastal birds and marine mammals in PWS waters and shores.

B. Objectives:

The purpose of this study is to monitor the recovery of species whose populations may have declined due to the spill by obtaining annual estimates of the summer and winter populations of marine birds and sea otters in PWS.

1. Determine distributions and estimate abundances, with 95% confidence limits, of marine birds and sea otters in PWS during summer and winter.

2. Determine the recovery of marine bird species populations that declined more in oiled areas than in unoiled areas of PWS since the early 1970's, specifically cormorants, harlequin ducks, black oystercatchers, pigeon guillemots, northwestern crow, mew gulls, Arctic tern, and scoters.

3. Support restoration studies on harlequin ducks, black oystercatchers, pigeon

guillemots, marbled murrelets, and other marine birds and sea otters by providing data on population changes and distribution within PWS.

4. Identify critical habitats of PWS species of special concern, especially areas that may be purchased and thus protected.

C. Methods:

1. Sampling Methods

Survey methodology will remain identical to that of post-spill surveys conducted in 1989, 1990, 1991, and 1993. For these surveys, we will use three USFWS 25-foot Boston Whalers.

A stratified random sampling design with shoreline, coastal-pelagic and pelagic strata will be used. The shoreline stratum includes all water within 200 m of shoreline, the strip of land within 100 m of the shore, and air space to an altitude of 100 m. Irons divided the shoreline stratum of PWS into 742 transects, then in 1989, we selected a random sample of 25 % of these transects. Since 1990, we have surveyed all transects sampled in summer 1989, plus 25 additional transects or 28% of the transects surveyed by Irons. The additional transects were randomly selected from the western Sound to increase the precision of estimates for the oiled area. For the March survey, the number of transects are reduced to 13 % of the total because weather delays often extend the time required to complete the survey.

Both coastal-pelagic and pelagic strata consist of plots of water delineated by 5-minute latitude and longitude intervals and exclude any water within 200 m of the coast. Coastal-pelagic plots intersect more than 1 nm (nautical mile) of shoreline, while pelagic plots intersect less than 1 nm of shoreline. Two north-south transect lines located 1 minute inside the east and west boundaries of each pelagic and coastal-pelagic plot are surveyed. When a plot is too small to contain 2 transects due to intersection with land, it is combined with an adjacent plot.

2. Data Analysis

As in previous surveys, we will use a ratio estimator to estimate population abundance. Summer and winter population estimates for each species or species group will be added to other post-oil spill population estimates to determine population trends. Regression analyses will be used to document the recovery of injured species and population changes of other species.

3. Alternatives

Aerial surveys are a potential alternative to these boat surveys. The major disadvantage to this method is the bias caused by observers being unable to see

all birds present. Counts from aerial surveys are usually much lower than those from boat-based surveys, creating higher variances in population estimates. Aerial surveys in PWS have often required the same amount of time to complete because of the weather, thus aerial surveys offer no temporal advantage over boat-based surveys.

D. **Location:**

This study will be conducted in PWS. The entire Sound, including oiled and unoiled areas, will compose the study area.

E. **Technical Support:**

All technical aspects, such as GIS, will be conducted by project personnel, therefore outside technical support is not needed.

F. **Contracts:**

This project includes two contracts of approximately $36,000 to provide logistical support for the smaller Boston Whalers. A vessel large enough to provide lodging and meals for 9 people and 300-350 gallons of fuel per day will be chartered for logistical support and safety during the surveys.

SCHEDULES

1994	Jan. - Feb.:	Prepare Detailed Study Plan, hire personnel, make logistic arrangements for winter survey
	Mar. 1 - 20:	Conduct winter survey
	Apr. - June:	Data entry, make logistic arrangements for summer survey
	Jul. 5 - 25:	Conduct summer survey
	Aug. - Nov.:	Equipment storage, data entry, data analysis and report writing
	Dec. 15:	Draft Report to Oil Spill Office
1995	Feb. 1:	Draft Report to Peer Review Committee
	Mar. 31:	Final Report complete

EXISTING AGENCY PROGRAM:

Migratory Bird Management has been involved in several studies in the PWS area, including marbled murrelets, black oystercatchers, black-legged kittiwakes and pigeon guillemots. In addition to our studies in PWS, we are presently conducting similar work in lower Cook Inlet, another region of the spill zone. The cost for the Cook Inlet 1993 study was $203,058 and projected cost for the 1994 study is $226,331.

ENVIRONMENTAL COMPLIANCE/PERMIT/COORDINATION STATUS

This study relies on observations from boats and is a non-intrusive study. Based on a review of the CEQ regulation 40 CFR 1500-1508, this study has been determined to be exempt from the requirements of NEPA in accordance with 40 CFR 1508.4. Based on a review of CEQ regulation 40 CFR 1500-1508, this study qualifies for a categorical exclusion from the requirements of the National Environmental Policy Act, in accordance with 40 CFR 1508.4.

PERFORMANCE MONITORING

To ensure that project design and procedures are followed, (1) all crew members will partake in training surveys prior to initial surveys, (2) one person on each boat will be responsible for maintaining consistent data collection procedures, (3) standardized forms will be used during data collection, (4) data forms will be checked at the end of each day to ensure the integrity of the data, and (5) all data entered into the computer will be carefully checked for errors. An observer manual, describing data collection methods, was developed to maintain consistency in data collection over time and among observers. Use of GPS technology, for finding and checking transect coordinates, will help insure data accuracy as well.

FY94 BUDGET ($K)

AGENCY	USFWS
Personnel	
Travel	
Contractual	
Commodities	
Equipment	
Capital Outlay	
Sub-total	0.0
General Administration	
TOTAL	0
NEPA COMPLIANCE	0.0

EXXON VALDEZ OIL SPILL PROJECT DESCRIPTION

Title: Forage Fish Influence on Injured Species

Project Number: 94163

Lead Agency: NOAA

Cooperating Agency: ADF&G

Project Cost, FY94: $95.4K ADF&G

Project Startup Date: April 1994 **Duration:** 5 Years

Geographic Area: Prince William Sound and adjacent Gulf of Alaska waters

INTRODUCTION

A better understanding is needed of how prey availability affects distribution, abundance, growth and reproductive success of apex predators. Efforts to restore predatory species affected by the oil spill, particularly harbor seals, pigeon guillemots, marbled murrelets, common murres, and salmon, could be delayed or completely unsuccessful without understanding distribution, abundance, and availability of important forage fish including herring, pollock, sandlance, and capelin.

The overall forage fish project will evaluate existing field methods used in determining distribution, abundance, availability, and class composition of forage fish. Provisions will be included to model affects of changing oceanographic regimes on forage fish species' distribution, abundance, and productivity. Oceanographic regimes will be characterized by measuring, at a minimum, currents, salinity, and temperature.

A sampling program will be designed to provide distribution, densities and species composition of forage fish species. This project will also provide information on sex, age, growth, food habits, recruitment, and mortality of forage fish species. Field surveys will determine locations of where apex predators forage and the distribution, abundance, and availability of forage fish of both nearshore and offshore waters within PWS and adjacent Gulf of Alaska waters. Ecosystem models to estimate biomass and productivity of forage fish species will be selected, evaluated, and refined.

PROJECT DESCRIPTION

A. Resources and/or Associated Services

This project will concentrate on determining distribution, abundance, and availability of

important prey species (e.g., herring, pollock, sandlance, capelin, euphausiids, copepods) to predatory species affected by the oil spill (i.e. harbor seals, pigeon guillemots, marbled murrelets, common murres, and pink salmon). Diet overlap and prey selection among forage fish species will also be examined. This information, trophic position and niche overlap among species, will be used to establish the basic structure of the ecosystem model. The models of changing oceanographic regimes and prey species productivity and distribution would be necessary for understanding recovery of predatory species, and useful in guiding recovery activities.

B. Objectives

1. Determine temporal and spatial distribution, abundance, and availability of important prey species (e.g., herring, pollock, sandlance, capelin, euphausiids, copepods) in PWS.

2. Determine how important biotic and abiotic factors affect both short- and long-term distribution and abundance of prey species in the oil spill area.

3. Determine how predator distribution, abundance, and foraging strategy coincide with forage fish distribution and abundance.

4. Evaluate existing field methods used in determining distribution, abundance and availability of forage fish.

5. Design and verify, with field tests, a sampling program which determines densities and species composition of forage fish relative to the locations of their predators including marine mammals, marine birds, and salmon. Begin reconnaissance surveys in selected areas of PWS.

6. Characterize oceanographic measurements including, at a minimum, currents, salinity, and temperature.

7. Initiate development of ecosystem models to estimate productivity of forage fish.

8. Determine forage fish prey as determined from stomach content analysis for fish collected from nearshore and offshore sites, and estimate degree of diet overlap among species.

C. Methods

Various sampling techniques will be evaluated including hydroacoustics, side-scan sonar, mid-water trawls, purse seines, and small mesh beach seines. Specific methodology will be determined through competitive bidding and contract negotiation.

Juvenile forage fish will be sampled in offshore areas using a mid-water trawl net and in nearshore areas using a purse seine. Each species will be identified and length and weight measured on a minimum of 150 individuals randomly selected from each species in each sample. Fifteen fish from each species will be preserved in 10% buffered formaldehyde from each sample for later analysis of stomach contents. Samples of 15 individuals will be obtained for each available species from 75 sites in PWS. Samples for stomach contents analysis will be collected between 1500 and 2100 hours each day within a two week period during May 1994. Laboratory analysis of stomach samples will consist of enumeration and identification of prey to the lowest possible taxonomic level. Total stomach contents weight will be estimated by the sum of the average weight of all prey items in the stomach. The proportion of total stomach contents weight in each prey category will be estimated. Analysis of variance on the ranks will be used to test for differences ($P=0.05$) in prey composition among species. The prey electivity index will also be estimated using data obtained from zooplankton samples collected during fish sampling. Electivity indices will be compared among species.

Additional components of the study will be formulated for implementation in future years. Experts will be brought together as appropriate for development and review of the program. Participants to administer the components will be identified along with potential funding source.

D. Location

This project will concentrate its initial activities within PWS; however, some sampling design feasibility work may be performed in Gulf of Alaska waters adjacent to the Sound.

E. Technical Support

This project will generate data which will be useful to the monitoring projects and studies currently underway in PWS. In order to insure access to these data, the information collected from this project will be incorporated into the Comprehensive Monitoring Program data base sponsored by the Trustee Council.

F. Contracts

A consultant will be asked to:

1. Evaluate existing field methods used in determining distribution, abundance, and availability of forage fish (e.g., high-frequency quantitative acoustic sampling).

2. Design and implement a sampling program to, at a minimum, provide for determining densities and species composition of important invertebrate species (euphausiids, copepods, etc.). For fish species, provide for determining sex, age, growth, recruitment, mortality, etc.

3. Characterize oceanographic regimes by measuring, at a minimum, currents, salinity, and temperature.

4. Determine locations of where apex predators forage and conduct field surveys to validate productivity models of nearshore and offshore waters within PWS and the waters of the Gulf of Alaska adjacent to PWS.

5. Develop ecosystem models to estimate productivity of important prey species (both invertebrate and vertebrate forms), including provisions to model affects of changing oceanographic regimes on prey species productivity.

SCHEDULES

Soon after the contractor is established (approximately April 1994), work will begin on evaluating existing field methods used in determining distribution, abundance, and availability of important prey species. In conjunction with this, the contractor will begin to develop generic ecosystem models to estimate productivity of important forage fish species, and to design a sampling program which fulfills requirements of the ecosystem models. By May 1, 1994, these activities should be advanced enough to allow for the startup of initial field reconnaissance surveys to begin determining locations of forage fish and to validate effectiveness of survey techniques for future use. The productivity models will be refined each year as additional field data is obtained. Annual reports (first annual report due April 1995) will include progress on refining the productivity models. A project status report will be due Dec. 1994.

EXISTING AGENCY PROGRAM

ADF&G, PWSAC, VFDA, and UAF participate in the Cooperative Fisheries and Oceanographic Studies. Existing data collection program includes: monthly zooplankton sampling and CTD surveys of PWS; continuous temperature monitoring (0-90m C-LAB buoy in central PWS); bi-weekly zooplankton sampling (0-20m) at all PWSAC and VFDA

hatcheries; juvenile salmon sampling to estimate growth and feeding habits (May-July); application of coded-wire tags to juvenile salmon to estimate early-marine growth and survival to adult; and, satellite IR image processing for May-July each year.

ENVIRONMENTAL COMPLIANCE/PERMIT/COORDINATION STATUS

This project will fall under the categorical exclusion within NEPA. A major component of this project is essentially a planning exercise, and the other components are routine environmental sampling for which no requirement to undertake an additional National Environmental Policy Act review is necessary. NOAA will serve as the lead for NEPA compliance.

PERFORMANCE MONITORING

A project status report will be submitted by the contractor in Dec. 1994 which discusses existing field methods used in determining distribution, abundance, and availability of important prey species, and the process and justifications for selected survey techniques. The report will present and discuss the results of the field surveys including locations of forage fish and, when possible, the biomass of these species and forage fish prey as determined from stomach content analysis. The report will also describe and evaluate ecological models to estimate productivity of important prey species, and a sampling program to fulfill requirements of ecological models. Annual reports, (first annual report due April 1995) will include progress on refining the productivity models.

FY94 BUDGET ($K)

AGENCY	NOAA	ADF&G	USFWS	OAL
Personnel	66.0	74.2	40.4	180.6
Travel	10.0	0.7	4.0	14.7
Contractual	350.0	2.4	0.0	352.4
Commodities	0.0	3.3	5.3	8.6
Equipment	0.0	3.5	0.0	3.5
Capital Outlay	0.0	0.0	0.0	0.0
Sub-total	426.0	84.1	49.7	559.8
General Administration	29.4	11.3	6.1	46.8
TOTAL	455.4	95.4	55.8	606.6

NEPA COMPLIANCE 0.0

EXXON VALDEZ OIL SPILL PROJECT DESCRIPTION

Title: Herring Genetic Stock Identification in Prince William Sound

Project Number: 94165

Lead Agency: ADF&G

Cooperating Agency: None

Project Cost, FY94: $62.2K ADF&G

Project Startup Date: October 1993 **Duration:** 1 year

Geographic Area: Prince William Sound

INTRODUCTION

Herring are a major resource in Prince William Sound (PWS) from both a commercial and ecological perspective. The timing of the *Exxon Valdez* oil spill (EVOS) overlapped the annual spring migration of herring spawners to nearshore staging areas. Over 40% of the herring spawning staging and egg deposition areas (42 of 98 miles) and over 80% of the documented summer rearing and feeding areas were light to heavily oiled prior to the spawning events. As a result, herring encountered oil during each of their four life stages in 1989 and, to a lesser extent, in 1990. Adult herring traversed oil sheens and mousse while traveling northward and eastward. Eggs were deposited on oiled shorelines and were coated by sheen through tidal action while incubating. Larvae hatched that contained lipophilic petroleum hydrocarbons in their yolk sacs and encountered sheen near the surface while in their most sensitive stage. Post-larval or juvenile herring swam through and remained near lightly to heavily oiled shorelines, regularly encountering sheen, mousse, and dissolved oil particulates and components throughout the summer while feeding in shallow nearshore bays and passes.

In 1993, the total observed spawning population was less than one-third of preseason predictions and the average sizes of herring in each age class were some of the smallest on record. Of the four commercial herring fisheries which normally occur each spring, guideline harvests were attained for only one gear type (gillnet sac roe). Purse seine sac roe fishermen, who typically average about 66% of the annual harvest, did not realize any harvest due to low commercial quality and low abundance of herring. A preliminary pathology study implicated viral hemorrhagic septicemia (VHS) as a potential source of mortality. Recovery from oil-related injuries may be impacted by other factors such as VHS.

Determining genetically derived stock structure is will aid the success of many fisheries or restoration programs. Consistent overexploitation of mixed stocks leads to the demise of less productive stocks. Unfortunately, defining the stock structure of herring has been particularly difficult. There is evidence that herring home, but straying may also be

substantial. Morphological differentiation of herring from discrete geographic regions has been used as evidence for the existence of genetically distinct stocks. But much of this variation may be environmentally mediated and has not been confirmed with genetic data.

Previous surveys of herring using the genetic techniques of allozyme electrophoresis have generally revealed differentiation only over broad geographic regions. Two distinct races of Pacific herring (Asian/Bering Sea - eastern North Pacific) have been defined, with further subdivision between Gulf of Alaska and more southerly North Pacific stocks. However, more recently, genetic divergence using allozyme markers has been described among local spawning populations of Pacific herring in the vicinity of northern Japan. This project would investigate whether similar genetic divergence exists in PWS herring projects.

An explosion of new genetic techniques has occurred in recent years as a result of recent advances in molecular biology. The utility of these newer techniques to detect fine genetic structure in Pacific herring has not been properly assessed. We propose to use a combination of current allozyme techniques combined with mitochondrial and nuclear DNA techniques to more accurately define the stock structure of herring from the EVOS-affected area. The data can also be used to estimate the stock composition of non-spawning aggregations contributing to the fisheries in Prince William Sound. If this project documents distinct stocks in PWS, the stock structure data will be essential to the stock assessment model in PWS and therefore the development of a restoration plan.

PROJECT DESCRIPTION

A. Resources and/or Associated Services

Pacific herring *Clupea harengus pallasi* are a major resource in Prince William Sound (PWS) from both commercial and ecological perspectives. Five commercial herring fisheries in PWS have an average annual combined ex-vessel value of $8.3 million. Pacific herring provide important forage for many species including some species severely injured by the EVOS. Predator species include humpback whales, seals, sea lions, gulls, sea ducks, shorebirds, halibut, salmon, rockfish, and other fish. In addition, several thousand pounds of herring and herring spawn-on-kelp are harvested annually for subsistence purposes and form an important part of the local native culture of Chenega and Tatitlek.

The goal of this project is to improve the accuracy of current stock assessment methods and models, thus improving resource management. Incorporating genetically-derived stock structure information is crucial to the success of any fisheries or restoration program. Improved accuracy will allow fishery managers to make appropriate adjustments of fishing quotas to harvest the maximum available surpluses with the lowest possible risk of overharvest, injury to the resource, or economic loss to the fishing industry. Because commercial and subsistence herring harvests represent substantial contributions to local economies, intensive management is expected to benefit all

communities in PWS. Restoration efforts can be directed and evaluated through improved fishery management and continued resource monitoring.

B. Objectives

A study to test for genetic heterogeneity among spawning aggregations of Pacific herring within PWS and adjacent areas will be initiated. The objectives of the study are to

1. Identify the most promising of the currently available molecular techniques for stock analysis. Techniques under consideration include DNA sequencing of mitochondrial and nuclear regions, mini satellite analysis (analysis of regions with variable number of tandem repeats (VNTR)), RAPD analysis (random amplified polymorphic DNA markers), and restriction analysis of mitochondrial DNA.

2. Attempt stock identification using allozyme protein electrophoresis.

3. Evaluate the utility of the allozyme and the other chosen molecular techniques to discriminate among putative herring stocks within and adjacent to PWS.

A comprehensive survey of the entire EVOS-affected areas may be proposed in future years pending the results of Objective 2.

C. Methods

Field collections of spawning Pacific herring will be made from four representative sites within PWS. The collection sites will be chosen to maximize the potential genetic differentiation among the aggregations. A sample of 100 individuals will be collected from each aggregation. Tissue extracts from muscle, liver, eye, and heart will be collected. Extracts from individual fish will be preserved in both alcohol and in liquid nitrogen.

A request for proposals will be issued for the molecular analyses to be conducted at the contractor's facilities. Allozyme electrophoretic analysis will be conducted by the Alaska Department of Fish and Game (ADF&G) following standard protein electrophoretic techniques.

The specific molecular techniques to be investigated will be chosen based on: 1) a review of the current literature and recently available research results and 2) responses and qualifications of competitive bidders.

D. Location

Field research will be conducted within the confines of PWS. Exact locations will depend upon the distribution of spawning herring. Laboratory studies and data analysis will be

conducted at the ADF&G area office in Cordova and the regional office in Anchorage.

E. Technical Support

Personal computers purchased under previous studies are adequate to complete this project. Data will be archived in accordance with standardized procedures set up for handling *Exxon Valdez* oil spill related databases.

F. Contracts

Proposals for development and survey of molecular techniques will be contracted to 1 or more qualified lab(s) using the State of Alaska competitive bid process.

SCHEDULE

Prepare, advertise, award contract	Oct 1993-Jan 1994
Collection of baseline samples	April 1994
Laboratory analyses	May-Oct 1994
Evaluation of results	Sept-Dec 1994
Preparation of final report	Jan-March 1995

EXISTING AGENCY PROGRAM

The statewide genetics laboratory within the ADF&G Division of Commercial Fisheries Management and Development is located in Anchorage and is well equipped for allozyme and DNA studies. Current staff include geneticists, a genetics biometrician, and laboratory technicians. Collection of specimens and biological data will be coordinated by the ADF&G's ongoing herring research program in PWS.

ENVIRONMENTAL COMPLIANCE/PERMIT/COORDINATION STATUS

The National Oceanic and Atmospheric Administration (NOAA) is the lead Federal agency for National Environmental Policy Act (NEPA) compliance for this project. This project meets NOAA agency requirements for Categorical Exclusion from the NEPA process.

The proposed studies provide for data collection and field sampling programs. No environmental effect of these programs occurs beyond that of traditional fisheries management data collection activities. These activities are within existing collecting permits or Federal special use permits issued to the ADF&G for scientific data collection. No other permits or other coordination activities are involved.

PERFORMANCE MONITORING

Project performance will be monitored through checks and balances of the Alaska State Accounting System within the ADF&G Divisions of Commercial Fisheries Management and Development (CFMDD), Habitat and Restoration, and Administration, and within the Department of Administration. Administrative provisions for hiring of personnel and contracting are covered in state standard operating procedures and administrative regulations and are monitored within the State of Alaska hiring and administrative chains of command. Hiring for new positions will follow state guidelines. Temporary reassignment of duties for existing permanent and seasonal CFMDD personnel in Cordova and Anchorage may be used as needed. Project time frames for reports and analyses will be maintained through proper planning and integration of these activities within the existing CFMDD administrative structures.

Scientific and technical aspects of the study are subject to internal review within the CFMDD reporting system. Publications are submitted through an internal peer review process with the major findings submitted to peer reviewed journals. Reports, work plans, and study design are subject to the peer review process established by the EVOS Trustee Council. Annual status reports will be generated with publications being provided in peer review journals and scientific symposia as significant findings are obtained. A final report will be issued upon completion of the final year of field data collection.

FY94 BUDGET ($K)

AGENCY	ADF&G
Personnel	20.0
Travel	1.0
Contractual	31.0
Commodities	5.0
Equipment	0.0
Capital Outlay	0.0
Sub-total	57.0
General Administration	5.2
TOTAL	62.2
NEPA COMPLIANCE	0.0

EXXON VALDEZ OIL SPILL PROJECT DESCRIPTION

Title: Herring Spawn Deposition and Reproductive Impairment

Project Number: 94166

Lead Agency: ADF&G

Cooperating Agency: NOAA

Project Cost, FY94: $239.2K ADF&G

Project Startup Date: October 1993 **Duration:** Three years

Geographic Area: Herring Spawning Grounds Throughout Prince William Sound

INTRODUCTION

The *Exxon Valdez* oil spill coincided with the spring migration of Pacific herring, *Clupea harengus pallasi*, to spawning grounds in Prince William Sound (PWS). Adult herring swam through oiled waters on their way to nearshore staging areas. Studies of oil spill injuries to herring were initiated in 1989. Research continued through 1992 with contributions from both state general funds and the Trustee Council. Significant histopathological injury was measured in adults collected in oiled areas in both 1989 and 1990 confirming exposure of the fish to toxins. Oiling of over 40% of the spawning areas (42 of 98 miles used) caused elevated levels of physical and genetic abnormalities in newly hatched larvae and reduced hatching success of the embryos. Over 80% of the summer rearing and feeding areas of herring were oiled in 1989 (based on oil trajectory and historic fisheries records to 1914). Mortality of young herring was statistically greater in oiled areas than in unoiled areas in 1989 and 1990, and sublethal effects were measurable in larvae and adults in 1989 and 1990. Persistent sheening from beaches and cleaning operations in 1989 and 1990 continued to expose adult and juvenile herring to oil. Laboratory exposure of pre-spawning adult herring to oil show high concentrations of hydrocarbons in the ovarian tissue. Laboratory studies measuring the effect of known doses of oil on newly hatched larvae provided a direct link between estimated doses of oil measured in PWS and the level of injury observed in samples collected from the field. Although herring survival varies greatly under normal conditions, abundance for the 1989 year class is extremely low. The oil spill may have contributed to the poor returns.

One hypothesis is that injury to germ tissue caused by exposure to oil would result in non-viable embryos and larvae. Consequently, a pilot experiment to measure the ability of herring from this age class to produce viable offspring was conducted in 1992. Hatching success of eggs collected from fish spawning in previously oiled areas was less than half that of eggs collected from fish spawning in pristine areas. In 1993, the total observed spawning population was less than one third of pre-season predictions, and the average sizes of herring in each age class were some of the smallest on record. Of the four commercial herring fisheries which normally occur each spring, guideline harvests

were attained for only one gear type (gillnet sac roe). Purse seine sac roe fishermen, who typically average about 66% of the annual harvest, did not realize any harvest whatsoever, due to low commercial quality related to fish size and low abundance of herring. A preliminary pathology study implicated viral hemorrhagic septicemia (VHS) as a potential source of mortality and stress. It is not clear whether the spill may be implicated, although numerous studies have shown that previous exposure to toxins can reduce immunity to disease.

PROJECT DESCRIPTION

A. Resources and/or Associated Services

Herring are a major resource in PWS from both commercial and ecological perspectives. Five commercial herring fisheries there have an average annual combined ex-vessel value of $8.3 million. Herring also provide important forage for many species including some species severely injured by the spill. Predator species include humpback whales, seals, sea lions, gulls, sea ducks, shorebirds, halibut, salmon, rockfish, and other fish. In addition, several thousand pounds of herring and herring spawn on kelp are harvested annually for subsistence purposes and form an important part of the local Native culture of Chenega and Tatitlek.

The primary goals of the proposed project are to improve the accuracy of fisheries management of the PWS herring resources and to determine whether genetic injury to early life stages of herring can be caused by exposure of pre-spawning adult, egg, and larval stages to oil and relate this injury to larval survival potential. Accurate and precise estimation of herring abundance is crucial to the improvement of management accuracy. Improved accuracy will allow fishery managers to make appropriate adjustments of fishing quotas to harvest the maximum available surpluses with the lowest possible risk of overharvest and additional injury to the resource, or of underharvest and economic loss to local communities. Because commercial and subsistence herring harvests represent substantial contributions to local economies, intensive management is expected to benefit all communities in PWS. Modification of management actions to more conservative harvests may be necessary if the stocks appear to be suffering from reproductive impairment.

B. Objectives

Specific objectives of this project include the following:

1. Estimate the biomass of spawning herring in PWS using SCUBA diving spawn deposition survey techniques such that the estimate is within $\pm$ 25% of the true value 95% of the time.

2. Estimate the proportion of eggs removed from the spawning areas due to wave action or predation between the time of egg deposition (spawning) and

the time of hatching.

3. Determine whether herring eggs and larvae exposed to oil suffer genetic injury.

C. Methods

Estimates of spawning biomass will be included in ongoing Alaska Department of Fish and Game (ADF&G) investigations of age structured analysis of PWS herring stocks to project the biomass of herring returning to spawn (run biomass) in 1995. This forecast of run biomass will be used directly to set guideline harvests for herring commercial fisheries. Spawning biomass estimates and results from laboratory studies will be combined with information from previous herring research studies to continue evaluation of oil spill-related injury to the resource and to grossly assess the progress of resource rehabilitation. However, results from the proposed project are likely to have only limited utility to assess resource rehabilitation without additional knowledge of stock discreetness and mixing and recruitment processes.

Specific methods to be used for spawn deposition surveys will be similar to methods established in previous studies. Aerial surveys conducted as a regular part of commercial fishery management activities will be used to estimate the extent and distribution of herring spawn and to provide the basis for locating survey transects at nearshore spawning grounds. SCUBA divers will conduct surveys along transects to estimate the number of herring eggs deposited on vegetation and bottom substrate. Preserved samples of eggs attached to vegetation will be collected and retained for later laboratory analysis. Field estimates of the number of eggs attached to the vegetation will be compared to more rigorous laboratory egg counts to calculate diver-specific and vegetation-specific bias.

Representative samples of spawning herring will be collected for determination of age, weight, length, and sex as part of regular ongoing data collection programs. Egg counts adjusted for measured diver and substrate bias will be combined with estimates of the extent of total spawning area and area sampled to estimate the total number of eggs deposited in PWS. The spawning biomass required to produce this total will be calculated from total egg deposition, average fish size and sex ratio for 1994, and average fecundity at size measured in previous studies.

Estimates of natural loss of eggs due to predation and mechanical disturbance will be used to adjust spawning biomass estimates from spawn deposition surveys. Egg loss sampling sites will be established at three depths along several transects at each major spawning concentration. Divers will estimate the number of eggs contained within replicate quadrats at each site every four days and samples will be collected and preserved for laboratory validation of diver estimates.

Hydroacoustic (sonar) and seine surveys of herring in winter feeding areas and of herring migrating into spring spawning areas were considered as an alternative method for

assessing biomass. However, the suitability of using hydroacoustic methodology for PWS herring has not been demonstrated, and results from previous hydroacoustic surveys were not credible due to poor sample design and inappropriate gear. Improved hydroacoustic techniques have a high probability of successfully yielding cost-effective, real-time estimates of herring biomass. But demonstrating suitability could take from one to three years of technique development and would require research on stock discreetness and distribution to be meaningful. Spawn deposition was selected because the methods and applicability are well established and data from previous studies are available with which to compare estimates.

Genetic effects will be measured by exposing herring adults, eggs and juveniles to oil. Pre-spawning adults will be collected by purse seine shortly before they spawn. They will be maintained in the laboratory for 1 to 2 weeks, then exposed to oil. Before and after exposure, tissues (ovary, liver, muscle, and neural) will be collected for hydrocarbon analysis by gas chromatography and for mixed function oxidase (MFO) analysis. Bile will be collected to compare laboratory results with past and future bile measurements from field collected herring. After exposure adults will be artificially spawned at several different times to optimize hatching success in controls. Eggs will be maintained in clean running seawater until hatch. Samples will be collected for determination of genetic aberrations at larval life stages, and several biological parameters such as survival, hatch timing, and growth will be monitored. Hatched larvae will be fed rotifers (a small invertebrate); feeding incidence will be routinely recorded. Mortality will be estimated at the endpoint. Samples will be collected for genetic analysis and growth. This experiment will continue approximately 3 weeks beyond larval hatch and terminate before larger food is required.

There will be two types of oil exposure, water soluble fractions of oil (WSF) and ingestion of oil. The WSF exposure will provide continuity with past research and serve as a reference with which to compare ingestion results. Ingestion of oil is a possible route of contamination of herring in Prince William Sound. Exposure by introducing a surface slick of oil above schooling herring, or by direct coating are impractical.

In year 2, exposures will begin in egg and larval stages; observation parameters will be the same as in year 1. In year 3, no new reproductive impairment lab work will be conducted, only the completion of chemical analyses and report writing

D. **Location**

Field research will be conducted within the confines of PWS. Exact locations will depend upon the distribution of spawning herring. Laboratory studies and data analysis will be conducted at the ADF&G area office in Cordova and regional office in Anchorage and at the NOAA laboratory in Auke Bay.

E. Technical Support

Administrative support will be provided by ADF&G and the Alaska Department of Administration (ADA) staff. Because these studies will be integrated with existing ADF&G research and management programs, project leaders, divers, seasonal field staff, and biometrics staff are not fully funded by this project and are supported primarily with State General Funds. Laboratory processing of calibration and egg loss samples will be completed in the Cordova office lab by ADF&G seasonal personnel funded by this project. The Cordova lab is currently inadequate and is scheduled to be remodeled, using State funds, to meet Occupational Safety and Health Act (OSHA) regulations. Additional costs are expected to be incurred to ensure that work is completed in time for the 1994 field season. In the event that remodelling is not completed on time, it will be necessary to rent other facilities such as lab space at the Prince William Sound Science Center in Cordova. Data will be archived by project staff in accordance with standardized procedures set up for handling oil spill related databases.

Auke Bay chemists will participate in the reproductive impairment experiment, including dosing, and analyze samples for hydrocarbons. Computer services, data archiving, and GIS mapping are all services available in-house at the Auke Bay Laboratory.

F. Contracts

Field data collections for each study component will require the use of contracted vessels secured through an open competitive bid process. Ample biometrics support is not currently available within ADF&G to support sample design and data analysis for the egg loss component, and an attempt will be made to recruit a qualified biometrician. However, if a qualified person cannot be secured within ADF&G, this work will be subcontracted. A purse seiner will be contracted to collect the adult herring required for the reproductive impairment experiments. Contractors may be solicited to perform analyses of genetic aberrations, MFO, histopathology, and bile.

SCHEDULES

Spawn Deposition and Egg Loss:

Nov. 1993 - Feb. 1994	Initiate vessel charter bids and contract. Secure divers, ensure certification requirements are met or in progress. Complete data review and sample design for egg loss study. Complete sample design for diver calibration. Track and facilitate Cordova lab remodeling.
Mar. 1994	Complete any necessary diver certifications. Order spawn deposition laboratory supplies and field supplies. Complete Detailed Study Plan.

	Hire technician to finish maintenance and assembly of dive gear.
Apr. 1 - 5 1994	Complete all hiring of field personnel and arrange for arrival of divers. Complete vessel contract.
Apr. 1, 1994	Diver training/refresher/orientation. Set up laboratory.
Apr. 5 -15, 1994	Initiate diving/field data collection (at onset of spawning). Set up egg loss sites and begin diving.
May 1-12, 1994	Complete field activities. Begin lab processing of calibration samples.
May 30, 1994	Complete data entry of diver estimates.
May - June 1994	Maintain, repair, and store diving gear.
June 1994	Complete calibration sample processing.
June 30, 1994	Data entry of calibration samples. Initiate data analysis.
July 15, 1994	Complete egg loss sample processing and data entry.
Aug. 1, 1994	Preliminary biomass estimate.
Sep. 1, 1994	Finalize estimate of spawning biomass.
Nov. 15, 1994	Finalize projection of 1995 run biomass.
Dec. 1994	Complete final reports.

Reproductive Impairment:

Mar. 1994 - May 1994	Expose adults to oil.
Mar. 1994 - Jan. 1995	Analyze hydrocarbons, histopathology, MFO, and genetic aberrations.
Jan. 1995	Complete final 1994 report.
April - June 1994	Expose eggs and larvae to oil.
Mar. 1994 - Jan. 1995	Analyze hydrocarbons, histopathology, MFO, and genetic aberrations.

Jan. 1996	Complete final 1995 report.
Aug. 1996	Complete reproductive impairment final project report.

EXISTING AGENCY PROGRAM

Age, sex and size information for spawning escapements and catches will be collected through an ongoing ADF&G research program. Aerial surveys conducted by ADF&G in conjunction with management of commercial fisheries will be used to document spawning distribution and intensity. Biometrics and biological staff time for review of proposals, study plans, and routine analyses for biomass estimates and review of reports will be provided by existing ADF&G personnel. The Cordova lab is currently inadequate and is scheduled to be remodeled, using State funds, to meet Occupational Safety and Health Act (OSHA) regulations.

The NOAA will contribute 9 man-months of salary plus wetlab space, equivalent to $42k.

ENVIRONMENTAL COMPLIANCE/PERMIT/COORDINATION STATUS

The National Oceanic and Atmospheric Administration (NOAA) is lead federal agency for National Environmental Policy Act (NEPA) compliance for this project. This project meets NOAA agency requirements for Categorical Exclusion from the NEPA process.

These activities are within existing collecting permits or federal special use permits issued to ADF&G for scientific data collection. No other permits are required.

PERFORMANCE MONITORING

Scientific and technical aspects of the study will be subject to an internal peer review process within ADF&G's Commercial Fisheries Management and Development Division and NOAA's Auke Bay Laboratory's reporting systems. Work plans, study design, and final reports will be subject to the peer review process established by the Trustee Council and the Chief Scientist. Significant findings presented in final reports will be submitted for publication in peer reviewed journals and presentation at scientific symposia as they are obtained.

FY94 BUDGET ($K)

AGENCY	ADF&G	NOAA	OAL
Personnel	166.9	92.6	259.5
Travel	4.8	3.1	7.9
Contractual	64.9	50.0	114.9
Commodities	9.3	23.8	33.1
Equipment	3.9	0.0	3.9
Capital Outlay	0.0	0.0	0.0
Sub-total	249.8	169.5	419.3
General Administration	29.6	17.4	47.0
TOTAL	279.4	186.9	466.3
NEPA COMPLIANCE	0.0		

EXXON VALDEZ OIL SPILL PROJECT DESCRIPTION

Title: Pigeon Guillemot Recovery Monitoring

Project Identification Number: 94173

Lead Agency: USFWS

Cooperating Agency:

Cost of Project, FY94: $215.3 **Cost of Project, FY95:**

Project Startup Date: 10/93 **Duration:** 3 years

Geographic Area: Prince William Sound: Naked Island group; Fool, Jackpot, and Bligh Islands. Other guillemot colonies may be selected after further analysis of 1993 data.

INTRODUCTION

Pigeon guillemots (*Cepphus columba*) were negatively affected by the *Exxon Valdez* oil spill and have continued to show a population decline in Prince William Sound (PWS) since 1989. An estimated 2,000 to 3,000 guillemots were killed as a direct result of the spill, 33% of the 1991 estimated PWS population. Data from boat surveys indicate that the PWS summer guillemot population declined from 15,000 in 1972 to about 6,600 in 1991. Pigeon guillemot productivity and prey studies were conducted at Naked Island in 1978-81 and 1989-1990. Productivity rates differed significantly between oiled and unoiled colonies in 1989 and 1990. Similarly, shoreline censuses of Naked Island in 1989 and 1990 showed a significant decline in guillemot numbers along oiled shorelines. Latent affects from the spill may not show up for several years because guillemots do not breed until they are three or four years old. A colony survey was initiated in 1993 to locate breeding sites of guillemots in PWS. Approximately 1,800 guillemots were found at 160 colonies.

Reasons for the guillemot decline, beyond the immediate effects of the spill, are not well understood but may be related to a decrease in forage fish availability or increased predation at nest sites. One goal of this study is to determine the productivity and diets at colonies in PWS to determine reasons for the decline. Extending productivity and diet studies beyond Naked Island will test whether data collected in the past is representative of the Sound as a whole. Further monitoring of pigeon guillemot productivity and diets at other important sites in PWS will clarify reasons for the decline and enable resource managers to recommend concrete restoration measures for pigeon guillemots.

PROJECT DESCRIPTION

A. Resources and/or Associated Services

This project will benefit guillemots by identifying factors which might be affecting a population decline in PWS. Knowledge gained by monitoring guillemot populations might apply to other colonial seabirds in PWS.

B. Objectives

1. Census the breeding population of pigeon guillemots at all major colonies in the Sound.

2. Determine diets and foraging areas of pigeon guillemots from key colonies, including Naked Island.

3. Monitor reproductive success at key colony areas, including Naked Island.

4. Identify predators of eggs, chicks and incubating adults and identify guillemot populations most susceptible to predation.

e. Determine whether there is persistent oiling of guillemot eggs, internally or externally.

C. Methods

The largest colony areas discovered in the 1993 census will be surveyed again in 1994 to monitor the population trend of pigeon guillemots in PWS. Colonies will be surveyed at periods of peak attendance in late May and early June following the protocol used by the USFWS for the 1993 census. The outer coast of Hinchinbrook and Montague islands will be surveyed from the air for large concentrations of guillemots.

Foraging areas of guillemots from Naked, Fool, Jackpot, and Bligh islands will be determined by radio tracking and by observations of color-marked birds. Diets during chick feeding will be studied to compare prey selection and feeding rates with nesting success in different areas of PWS. Methods will be comparable with past feeding studies at Naked Island. Reproductive success will be monitored at Naked, Fool, and Jackpot islands, using methods refined during past Naked Island studies. The present study will compare productivity in different parts of the Sound and on Naked Island with past years.

Predators and types of nest sites and colonies that are most susceptible to predation will be identified during reproductive studies for comparison with prior data from Naked Island and elsewhere. Ten eggs from failed nests will be collected for hydrocarbon analysis. Field work for the entire project will extend from early May to late August.

D. Location

All major colonies located during the 1993 nesting colony survey throughout the Sound will be censused. More intensive studies of foraging, diets, and productivity will be located either at or on waters surrounding Naked, Fool, Jackpot, and Bligh islands, and/or wherever the guillemots may be discovered foraging. This project will identify guillemot restoration needs at different locations in the Sound. No areas or communities will be adversely affected by this project.

E. Technical Support

Ten unhatched eggs will be collected for hydrocarbon contamination analysis (both internal and external) to determine whether persistent oiling of eggs has continued beyond 1990.

F. Contracts

A multi-year contract has been awarded to Texas A & M for hydrocarbon analysis.

SCHEDULES

Milestones

Feb. 1-Apr. 31, 1994	Prepare detailed study plan and hire personnel, make logistic arrangements for summer field work and conduct safety training for all field personnel.
May 1-Aug. 31, 1994	Finalize preparations for field, conduct field work, clean and repair field equipment.
Sept. 1-Dec. 15, 1994	Data entry, analysis and report writing.
Dec. 15, 1994	Draft report due to Oil Spill Office.
Feb. 1, 1995	Draft report due to Peer Review Committee.
Apr. 31, 1995	Final report complete.

EXISTING AGENCY PROGRAM

Currently no ongoing program to monitor pigeon guillemots exists other than the Sound-wide boat surveys. Guillemot studies in the Sound, however, have previously been conducted through the Office of Migratory Bird Management (MBM). Some field, safety

and survival gear will be provided by MBM.

ENVIRONMENTAL COMPLIANCE/PERMIT/COORDINATION STATUS

Based on a review of the CEQ regulation 1500-1508, this study has been determined to be categorically excluded under the requirements of NEPA in accordance with 40 CFR 1508.4.

PERFORMANCE MONITORING

A report that summarizes the 1994 data and compares it to data collected in previous years will be submitted by the designated deadline.

FY94 BUDGET ($K)

AGENCY	USFWS
Personnel	
Travel	
Contractual	
Commodities	
Equipment	
Capital Outlay	
Sub-total	0.0
General Administration	
TOTAL	0
NEPA COMPLIANCE	0.0

EXXON VALDEZ OIL SPILL PROJECT DESCRIPTION

Title: Coded-wire Tagging of Wild Pink Salmon for Stock Identification in Prince William Sound

Project Number: 94185

Lead Agency: ADF&G

Cooperating Agency: None

Cost of Project, FY94: $286.0K

Cost of Project, FY95: $286K

Project Startup Date: October 1993

Duration: 2 years

Geographic Area: Prince William Sound

INTRODUCTION

Wild stocks of pink salmon (*Oncorhynchus gorbuscha*) are a critical component of the entire Prince William Sound (PWS) ecosystem. Extensive seaward migrations of pink salmon fry serve as both the dominant predators on zooplankton populations and as important prey for other fishes and birds. Historically, an average of 10 to 15 million pink salmon return from the high seas to spawn in PWS's hundreds of streams. These migrations are vital in sustaining a wealth of species that depend upon pink salmon to transport nutrients and energy from feeding grounds in the north Pacific to nearshore waters, freshwater streams, and upland ecosystems of PWS. In the past three years, the number of adult pink salmon returning to PWS have dramatically declined. Total returns of pink salmon have fallen from 1991's record high return of over 40 million fish to a near-record low return in 1992. Preliminary 1993 results indicate that this year's pink salmon return will continue this downward trend despite the strong parent year return in 1991 and continuous, steady, hatchery production from the four PWS pink salmon hatcheries.

The Alaska Department of Fish and Game's (ADF&G) intent to restore future PWS pink salmon escapements to historic levels will require both conservative and precise fisheries management strategies. Restoration efforts based upon inseason evaluation and manipulation of the commercial fishing fleet depends upon the manager's ability to identify and selectively reduce harvests on injured stocks. Management actions designed to protect wild pink salmon from overharvest in fishing districts with weak returns is the best option presently available to restore oil-impacted stocks from the southwest district of PWS. Stocks in that district have experienced higher egg mortalities, larval deformities, and lower juvenile growth rates than stocks from unoiled streams and

hatcheries. There is also evidence that oiled stocks may also have persistent genetic injury which has resulted in reduced egg survival in generations following the spill. Natural recovery from oil-related injuries will be hindered by extensive exploitation by the commercial fishing fleet targeting on hatchery stocks which in recent years have dominated the total return. The dominance by hatchery fish of the total return has further compounded the complexity of making precise management decisions that would positively benefit individual wild stocks. Evidence from Natural Resource Damage Assessment (NRDA) Fish/Shellfish (F/S) Study #3 in 1991 and 1992 suggests that spawning populations of wild fish in PWS were subjected to a high degree of straying by hatchery populations. Extensive straying by tagged wild stocks was also documented both years. The magnitude and range of straying by both hatchery and wild pink salmon stocks may be the primary influence in the success or failure of restoration efforts directed at wild stocks.

This project will provide marked wild fish of known origin for recovery in the commercial catch, natal and non-natal spawning streams, and hatchery broodstock collections. Stock specific harvest information from coded-wire tag recoveries will provide inseason estimates of stock abundance, timing and eventually total return and survival for tagged stocks. Stock specific information will be used to establish optimal exploitation rates, investigate straying, and evaluate current and future restoration efforts.

Alternative approaches considered included applying tags to wild fish at more locations while foregoing total outmigration enumeration. This approach was rejected. Without total enumeration of a stream's outmigration, tag recoveries would not be representative of the entire population.

PROJECT DESCRIPTION

Previous NRDA studies (F/S #1,#3) demonstrated the technical feasibility of applying coded-wire tags to wild pink salmon fry. Recoveries of tagged fish from the commercial catch and from numerous streams have demonstrated that accurate estimates of stock abundance, timing, survival, and straying can be obtained using this technology. Accurately estimating these parameters will be necessary in order to gauge the success of management actions designed to restore injured populations.

A. Resources and/or Associated Services

The potential biological and economic benefits that would be attained from consistently strong returns of wild pink salmon provide compelling arguments for improving our understanding of the resource. The ability of managers to maintain healthy stocks of wild pink salmon will directly benefit the resource and indirectly other species that rely on the injured resource. Strong wild stock returns to all districts of PWS would enable the commercial fishing fleet to fully utilize the hatchery enhanced component of the pink salmon return and any wild stock surplus, without putting injured stocks at further risk. Strong returns would also benefit the diversity of species that fully utilize pink salmon.

B. Objectives

The primary objective of the wild stock tagging project is to provide marked fish of known origin for eventual recovery in either the commercial catch or the escapement. Specific objective are to:

1. Enumerate and characterize the outmigration of wild pink salmon fry from two streams during both an even and an odd year.

2. Tag a representative subsample of pink salmon fry at each location, each season.

C. Methods

The total outmigration of wild pink salmon fry from two streams will be enumerated using fry weirs. A representative subsample will be marked and tagged with half-length coded-wire tags. A minimum of 100,000 fry per stream will be tagged.

D. Location

Two representative spawning streams, one in eastern PWS and one in the southwest district will be selected as study streams. Selection will depend upon a stream's 1993 escapement and our ability to totally enumerate the outmigration at that location.

E. Technical Support

Minimal technical support will be needed to complete the desired objectives of this project. Tag code validation and data archiving by the ADF&G Tag Lab will be the primary technical support needed for this project.

F. Contracts

Site selection may involve streams surrounded by private landowners or federally protected lands. Lease agreements may need to be established depending upon site selection.

SCHEDULES

October 1993 - February 1994: Study site selection and preparation, equipment preparation, seasonal personnel recruitment.

March 1994: Field work begins. Camps and fry weirs set up.

April 1994 - June 1994: Coded-wire tagging representative subsamples of wild pink salmon fry from two streams for later recovery from the commercial catch and the escapement (Projects 94-184 & 94-192).

FY 95: Same timeline and objectives as FY94.

Overall project supervision will be under the direction of the PWS Area Research Biologist. Hiring, training, and coordinating all field activities will be under the direction of a Fisheries Biologist. Field activities will be performed by seasonal Fish and Wildlife Technicians. The field work for this project will take place in the spring, both in 1994 and 1995. Winter conditions dominate the weather in PWS during this time of year. Field camp startup in March will require vessel support as will camp breakdown at the end of the project. Weekly supply flights are planned to support activities at the two field camps.

EXISTING AGENCY PROGRAM

This project will not receive any other agency contributions or support during FY 1994. The wild stock coded-wire tagging project is a stand-alone project. Results from the 1994 tagging program will be seen in the 1995 adult pink salmon return.

ENVIRONMENTAL COMPLIANCE/PERMIT/COORDINATION STATUS

The ADF&G will obtain Title 16 permits for both intertidal fry weirs. All sampling of salmon fry is covered by an ADF&G biological collection permit. Necessary lease agreements with private land owners will be arranged by project personnel and reviewed for approval by the ADF&G Administration's Division of Leasing and the Department of Law. Proposed camps and weirs are not permanent structures and will be removed at the termination of the project.

The National Oceanic and Atmospheric Administration (NOAA) is lead Federal agency for National Environmental Act (NEPA) compliance for this project. This project meets NOAA agency requirements for Categorical Exclusion from the NEPA process.

PERFORMANCE MONITORING

Personnel policy, purchasing practices, field camp operations, safety procedures and project administration will be in accordance with the ADF&G Division of Commercial Fisheries Management and Development Division Standard Operating Procedures Manual. Data collection and quality control procedures will be similar to those used for the wild stock tagging component of NRDA F/S Study #3 and in accordance with ADF&G Tag Lab database requirements. These procedures have undergone thorough review by ADF&G biometrics staff and by the Restoration Team peer review process. A report of the success of management actions bases on this data will be prepared.

FY94 BUDGET ($K)

AGENCY	ADF&G
Personnel	
Travel	
Contractual	
Commodities	
Equipment	
Capital Outlay	
Sub-total	0.0
General Administration	
TOTAL	0
NEPA COMPLIANCE	0.0

EXXON VALDEZ OIL SPILL PROJECT DESCRIPTION

Title: Pink Salmon Stock Genetics in Prince William Sound

Project Number: 94189

Lead Agency: ADF&G

Cooperating Agency: None

Cost of Project, FY94: $171.2K **Cost of Project, FY95:** $171.8K

Project Startup Date: October 1993 **Duration:** 2 years

Geographic Area: Prince William Sound

INTRODUCTION

Historically, approximately 500 million wild pink salmon fry emerged from streams throughout Prince William Sound (PWS) each year to migrate seaward. Adult returns of wild pink salmon averaged from 10 to 15 million fish annually. These returning wild stock adults convey essential nutrients and minerals from the marine ecosystem to estuaries, freshwater streams, and terrestrial ecosystems. Both juveniles and adults are important sources of food for many fishes, birds, and mammals. Wild pink salmon also play a major role in the economy of PWS because of their contribution to commercial, sport, and subsistence fisheries in the area.

Wild stock pink salmon suffered both lethal and sublethal injuries as a result of the *Exxon Valdez* oil spill. Pink salmon embryos and alevins suffered increased mortality and diminished growth due to oil contamination of rearing and spawning areas. Elevated mortality of embryos in the oiled streams has continued through 1993, raising the possibility of oil-induced genetic injury. Also, in 1989 the commercial harvest of pink salmon had to be shifted away from the hatchery and wild stocks in the oiled areas to target only the wild stocks in eastern PWS. This resulted in over-harvest and depletion of these stocks evidenced by general run failures of eastern PWS stocks in 1991. Wild stock run failures in the southwest area of the Sound have continued through the 1992 and 1993 fishing seasons.

PROJECT DESCRIPTION

An understanding of the population genetics of affected pink salmon populations will be used to guide restoration management decisions (including those regulating commercial harvest). Genetic monitoring and risk assessment are also required in order to evaluate any supplemental restoration programs. This monitoring and risk assessment is analogous to the

process currently being conducted to evaluate supplemental restoration of injured stocks on the Columbia River by the Northwest Power Planning Council. Our goal is to provide the basis for key management decisions by defining the genetic structure of representative populations from throughout PWS, measuring both within and between population diversity.

The information generated from this study will improve our understanding of the underlying mechanisms causing injury or limiting populations. The status of wild pink salmon populations was a concern prior to the oil spill. The documented injury to these populations further increases the concern and the need to understand the underlying population structure and amount of gene exchange among populations. Reproductively isolated populations are by definition self-recruiting--the adults generally do not stray to repopulate depleted areas. Therefore, basing management decisions on known population structure is critical for successful restoration. Harvest adjustments must be made upon known population genetic units in order to restore those reproductively isolated units.

A. Resources and/or Associated Services

In this study, pink salmon in PWS will be investigated.

B. Objectives

Specific project objectives are to:

1. Define the genetic structure of pink salmon stocks in the spill-affected area in order to better direct harvest management decisions made for restoration purposes on a stock-specific rather than species-specific basis.

2. Provide information needed for genetic risk assessment and genetic monitoring of supplementation programs (e.g., as a result of Restoration Project 94105) to guide stock-specific restoration and enhancement.

C. Methods

Tissues for baseline genetic data will be collected from up to 100 individuals from each of 30 spawning aggregations each year. This will include two hatcheries and 28 wild-stock streams in the affected areas of Prince William Sound. Pink salmon have a two-year life cycle. Even and odd-year pink salmon are genetically distinct, so both must be sampled. Sampling will be designed to include both early and late stocks and intertidal and upstream-spawning stocks. Tissue samples from heart, liver, muscle, and aqueous humor from each individual will be immediately frozen on liquid nitrogen and returned to Anchorage for storage at -80° C.

Sampling will be done in coordination with other restoration programs in order to reduce costs and facilitate cross-referencing of biological data. For example, suitable samples from odd-year stocks are already available from tissue collections made as a part other studies. Samples for even-year stocks would be collected as a part of Restoration Project #94192.

Genetic data will be collected using the techniques of allozyme electrophoresis on all samples. A pre-oil spill database of allozyme frequencies exists for Prince William Sound pink salmon which facilitates analyses of potential changes of population structure and gene flow. A pilot study using DNA techniques will be conducted on a subset of samples. The ADF&G anticipates contracting the laboratory analyses to a qualified bidder or bidders. Data analyses will be conducted by ADF&G, and data will be merged into the state and federal interagency databases.

D. Location

The field portion of this project will be conducted in Prince William Sound (based out of Cordova), and the data analyses will be completed in Anchorage. The project outcome will influence the long-term viabilities of wild stocks in PWS which will in turn affect the economies of the fishing communities therein.

E. Technical Support

Administrative support is provided by the Administrative, Habitat and Restoration, and Commercial Fisheries Development and Management Divisions staff of ADF&G. The project leader is fully funded with general funds from the State of Alaska. Project assistants are not fully funded by this project and are also largely supported with general funds. These studies are integrated with ongoing studies by the Commercial Fisheries Management and Development Division. Consequently, the investigations have been integrated into the normal operations of these divisions for efficiency in completing the objectives of these studies.

F. Contracts

The ADF&G anticipates awarding a contract in the approximate amount of $90.0K for allozyme analysis. Pilot work on DNA analyses will not exceed $20.0K.

SCHEDULES

Sept.-Nov. 1993	Prepare, advertise, and award contract for lab analyses
Jan.-Apr. 1994	Lab analyses (odd-year samples)
Apr.-June 1994	Data analyses
July-Aug. 1994	Additional field collections
March 1995	Draft status report for FY 1994
June 1995	Final status report for FY 1994
Sept.-Dec. 1995	Lab analyses (even year)
Jan.-Mar. 1996	Data analyses (even year)
March 1996	Draft status report for FY 1995
June 1996	Final report

EXISTING AGENCY PROGRAM

The ADF&G spends approximately $30.0K annually on PWS field studies and $500.0K annually on other non-oil spill related genetics studies.

ENVIRONMENTAL COMPLIANCE/PERMIT/COORDINATION STATUS

The National Oceanic and Atmospheric Administration (NOAA) is lead Federal agency for National Environmental Policy Act (NEPA) compliance for this project. This project meets NOAA agency requirements for Categorical Exclusion from NEPA compliance.

The studies proposed provide for data collection and field sampling programs. This project will have no environmental effect beyond that of traditional fisheries management data collection activities. These activities are authorized by existing collecting permits or Federal special use permits issued to the ADF&G for scientific data collection. No other permits or other coordination activities are needed.

PERFORMANCE MONITORING

The performance monitoring of this project is through the checks and balances of the State of Alaska Accounting System within the Commercial Fisheries Management and Development, Habitat and Restoration, and Administration Divisions of the Department of Fish and Game and the Department of Administration. Contractual compliance, personnel hiring, EEO compliance, and other administrative provisions are within the State of Alaska hiring and administrative chains of command and covered in standard operating procedures and administrative regulations. Replacement personnel are readily available by reassignment from permanent and seasonal staff within the Commercial Fisheries Management and Development Division of the ADF&G in Cordova and Anchorage when temporary problems are encountered. Filling new positions follows state hiring guidelines when permanent vacancies occur. Project time frames for reports and analysis are maintained through proper planning and integration of these activities within the existing administrative structure of the Commercial Fisheries Management and Development Division.

The scientific and technical aspects of the study are subject to internal review within the Commercial Fisheries Management and Development Division. Publications are submitted through an internal peer review process with the major findings submitted to peer review journals. Reports, work plans, and study design are subject to the peer review process established by the Trustee Council and the Chief Scientist's office. This year's oil spill related genetics studies were presented at the international symposium "Genetics of Arctic and Subarctic Fish and Shellfish" and are currently undergoing external review.

This study provides the basis for the management programs being developed under other oil spill restoration projects. Final annual reports will be generated and presented in peer review journals and scientific symposia, as significant findings are obtained. The final project report will be issued upon completion of the final year of field data collection.

FY94 BUDGET ($K)

AGENCY	ADF&G
Personnel	
Travel	
Contractual	
Commodities	
Equipment	
Capital Outlay	
Sub-total	
General Administration	
TOTAL	
NEPA COMPLIANCE	0.0

EXXON VALDEZ OIL SPILL PROJECT DESCRIPTION

Title: Oil Related Egg and Alevin Mortalities

Project Number: 94191

Lead Agency: ADF&G

Cooperating Agency: NOAA

Project Cost, FY94: $202.5K ADF&G

Project Startup Date: October 1, 1993 **Duration:** 3 years

Geographic Area: Prince William Sound

INTRODUCTION

Each year approximately one-half billion wild pink salmon fry emerge from the streams of Prince William Sound (PWS) and migrate seaward. Adult returns of wild pink salmon to PWS average from 10-15 million fish annually. These huge outmigrations of wild pink salmon and subsequent adult returns play a major role in the PWS ecosystem. Both juveniles and adults are important sources of food for many fish, birds and mammals. Adults returning from the high seas also convey needed nutrients and minerals from the marine ecosystem to estuaries, freshwater streams, and terrestrial ecosystems. Wild pink salmon also play a major role in the economy of PWS because of their contribution to commercial, sport and subsistence fisheries in the area.

Up to 75% of pink salmon spawning in PWS occurs in intertidal areas. In the spring of 1989, oil from the *Exxon Valdez* oil spill was deposited in layers of varying thickness in intertidal portions of many western PWS streams used by spawning salmon. Pink salmon eggs and fry rearing in these intertidal areas appear to have been adversely affected by the oil. Salmon egg mortalities were 67%, 51% and 96% higher in oiled streams than in comparable and nearby unoiled streams in 1989, 1990, and 1991 respectively. Differences between oiled and unoiled streams in 1989 and 1990 were confined to intertidal spawning areas and may be attributed to direct lethal effects of oil. Large differences observed across all tide zones in 1991 may be the consequence of injury to germ cells of the adults which originated from the 1989 brood year when egg and larval exposures to intertidal oil were greatest. A consequence of this genetic injury may be persistent sterility and reduced returns per spawner for populations from oiled streams.

The proposed damage assessment and resource monitoring study is a continuation of past work. It will consist of field and laboratory studies conducted in western PWS and additional laboratory studies at the National Marine Fisheries Service (NMFS) research facility at Little Port Walter in southeastern Alaska. Results of the project will direct future restoration

efforts for pink salmon and may impact future harvest management strategies in PWS fisheries.

The project will continue to monitor egg mortalities in the oiled and unoiled wild pink salmon streams previously studied, examine stream characteristics unrelated to oiling which may help to explain the observed differences in egg mortality, and provide a laboratory evaluation of the 1989 and 1990 field results. The laboratory evaluation will also test the hypothesis that oil contamination during incubation can result in functional sterilization.

PROJECT DESCRIPTION

A. Resources and/or Associated Services

This study will investigate pink salmon in PWS.

B. Objectives

Component A - Recovery Monitoring of Injury to Pink Salmon Eggs and Preemergent Fry in PWS.

1. Estimate the density, by tide zone, of preemergent fry in 48 streams and eggs in 31 streams using numbers of live and dead eggs and fry.

2. Estimate egg mortality and overwinter survival of pink salmon eggs in both oil contaminated and unoiled (control) streams.

3. Assess any loss in adult production from changes in egg mortality or overwinter survival using results of past Natural Resource Damage Assessment (NRDA) studies.

Component B - Evaluation of Injury to Pink Salmon Gametes in PWS.

1. Determine whether the increased pink salmon egg mortalities observed in oil contaminated streams in 1989, 1990, 1991, and 1992 can be attributed to the physical characteristics of study streams.

Component C - Laboratory Evaluation of Injury to Pink Salmon Eggs and Preemergent Fry Exposed to Oiled Incubation Substrate.

1. Determine survival, genetic injury hydrocarbon uptake, mixed function oxidase activity, and sublethal teratogenic effects from long-term exposures to oil in eggs exposed from fertilization to emergence.

2. Determine growth characteristics from each exposure group from juvenile stage to maturity.

3. Assess whether differences exist among exposure groups with respect to fecundity, fertilization rate, genetic injury, and sub-lethal teratogenic effects in the second generation progeny through swim-up (the stage at which fry leave the gravel and are no longer in intimate association with oiled substrate).

Combining Field Observations and Laboratory Results.

1. Determine if the elevated egg mortalities in 1989 and 1990 were potentially caused by oil in the environment.

2. Determine if the elevated egg mortalities in oil contaminated streams in 1991 were potentially caused by genetic injury to 1989 eggs.

C. Methods

Component A - Recovery Monitoring of Injury to Pink Salmon Eggs and Preemergent Fry in Prince William Sound.

A systematic sampling program stratified by stream and tide zone will be used to collect egg and fry density and survival data from 10 oil contaminated and 15 control sites sampled previously in NRDA Fish/Shellfish Study #2, Restoration Project #R60C, and Restoration Project #93003. Sampling will consist of egg sampling conducted in late September and early October, and fry sampling in mid-March. Egg and preemergent fry data will be summarized by date, stream, level of hydrocarbon impact, and stream zone. Density estimates will be used to assess adult spawning success. Relative numbers of live and dead eggs and fry will be used to test for continued reductions in survival in oil-contaminated streams.

Component B - Evaluation of Injury to Pink Salmon Gametes in Prince William Sound.

This project will continue to monitor the incubation of the intra-stream crosses made during Restoration Science Study #93003. Eggs from the crosses will be incubated through hatching in a controlled laboratory environment. Egg mortalities will be compared for all crosses. Crossing results will be compared to results from field studies to determine the effect of stream characteristics on egg mortality differences previously observed between oiled and unoiled sites.

Component C - Laboratory Evaluation of Injury to Pink Salmon Eggs and Preemergent Fry Exposed to Oiled Incubation Substrate

This project will evaluate the degree of injury to embryos incubating in oiled substrate and determine the subsequent effects on fertility. Incubating pink salmon eggs will be exposed to oiled gravel in incubators from fertilization to emergence. Surviving fry will be grown to maturity and crossed with partners incubated under the same dose of oil. Relationships between dosage and fertility will be observed in addition to relationships between dosage and

developmental success.

D. Location

Component A. All egg and preemergent fry monitoring will take place in PWS.

Component B. The experiment designed to evaluate the effects of environment on egg mortality will use gametes taken from salmon from streams in Western PWS. The resulting embryos will be incubated at the Armin F. Koerning hatchery.

Component C. The experiment designed to test the effects of oil-contaminated incubation substrate on gamete viability will be performed at the National Marine Fisheries Service (NMFS) laboratory at Little Port Walter, Baranof Island, southeastern Alaska.

All work on the assessment of genetic injury will be performed at the regional office of the Alaska Department of Fish and Game in Anchorage.

E. Technical Support

A biometrician will ensure that the study design provides a reasonable chance of reaching a defensible conclusion.

A flow cytometry specialist will ensure proper tissue collection and preparation procedures, operate the flow cytometer, and assist in histogram interpretation and analysis. Flow cytometry is used to detect genetic injury by measuring chromosome breakage and recombination.

A chemist is required to establish a dosing protocol, determine hydrocarbon concentrations, and evaluate results of hydrocarbon analysis.

F. Contracts

Contracts will be required for histopathological and mixed-function oxidase work. It is essential that the methodologies used to analyze the data for this controlled experiment be consistent with the methodologies used in the NRDA analyses.

SCHEDULES

Component A:

Oct 1-15, 1993	Egg deposition sampling
Oct 30-Dec 30, 1993	Analysis of egg data and completion of FY93 final report
Mar 15-Apr 10, 1994	Preemergent fry sampling
May 1-Sep 1, 1994	Analysis and summarization of preemergent fry data

Component B:

Oct 1-Nov 15, 1993	Monitor incubators and collect data
Nov 15, 1993-Jan 30, 1994	Analyze data and prepare annual report

Component C:

Time Period	1992 Brood Year	1993 Brood Year
Oct 1, 93-Apr 15, 1994	Culture in netpens	Continue incubating eggs
Apr 15-Sept 1, 1994	Spawn mature adults	Pond and PIT tag
Sept 1, 1994-Apr 15, 1995	Incubate F1	Culture in netpens
Apr 15-Sept 1, 1995	Analyze incubation	Spawn mature adults data from F1, prepare report
Sept 1, 1995-Apr 15, 1996	N/A	Incubate F1
Apr 15-Aug 1, 1996	Analyze incubation data from F1, prepare final report	

EXISTING AGENCY PROGRAM

An additional $30.0K will be provided by the ADF&G through normal operating funds. This amount is budgeted to cover the normal preemergent fry sampling program which has been conducted annually since 1961.

ENVIRONMENTAL COMPLIANCE/PERMIT/COORDINATION STATUS

Egg and preemergent fry sampling will require an ADF&G Title 16 permit and ADF&G biological collections permit. Transportation of wild gametes to the Prince William Sound Aquaculture Corporation hatchery will require and ADF&G Fish Transport Permit for each stock and a permit alteration may be required to rear and incubate the wild eggs at the hatchery.

The National Oceanic and Atmospheric Administration (NOAA) is lead Federal agency for National Environmental Policy Act (NEPA) compliance for this project. This project meets

NOAA agency requirements for Categorical Exclusion from the NEPA process.

PERFORMANCE MONITORING

This will be a joint project between ADF&G and NMFS. ADF&G will be the lead agency for overall program management and genetic injury determinations. ADF&G will be responsible for data collection, gamete fertilization, and incubation in Components A and B. NMFS will be responsible for oil exposures, chemistries, fish culture, and hydrocarbon end points in Component C. Both agencies will have statistical analysis responsibilities, particularly with the experimental designs. Both agencies will have joint responsibilities for combining the lab and field results to reach a conclusion in the study.

FY94 BUDGET ($K)

AGENCY	ADF&G	OAA	OAL
Personnel	267.4	213.7	481.1
Travel	10.1	21.4	31.5
Contractual	58.0	50.0	108.0
Commodities	27.0	38.5	65.5
Equipment	2.1	15.0	17.1
Capital Outlay	0.0	0.0	0.0
Sub-total	364.6	338.6	703.2
General Administration	44.2	35.6	79.8
TOTAL	408.8	374.2	783.0
NEPA COMPLIANCE	0.0		

EXXON VALDEZ OIL SPILL PROJECT DESCRIPTION

Title: Estimation of Straying Rates Among Hatchery and Wild Pink Salmon Populations in Prince William Sound.

Project Number: 94192

Lead Agency: ADF&G

Cooperating Agency: None

Cost of Project, FY94: $640.5K Cost of Project, FY95: $641.7K

Project Startup Date: October 1993 Duration: 3 years

Geographic Area: Prince William Sound

INTRODUCTION

Each year approximately one-half billion wild pink salmon fry emerge from streams throughout Prince William Sound (PWS) and migrate seaward. Adult returns of wild pink salmon average from 10 to 15 million fish annually. These huge outmigrations of wild pink salmon and subsequent adult returns play a major role in the PWS ecosystem. Both juveniles and adults are important sources of food for many fish, birds, and mammals. Adults returning from the high seas also convey needed nutrients and minerals from the marine ecosystem to estuaries, freshwater streams, and terrestrial ecosystems. Wild pink salmon also play a major role in the economy of the Sound because of their contribution to commercial, sport, and subsistence fisheries in the area.

Wild pink salmon stocks in oiled portions of PWS have experienced higher egg mortalities, larval deformities, and lower juvenile growth rates than stocks from unoiled streams and hatcheries. There is also evidence that they may also have persistent genetic injury which has resulted in reduced egg survival in generations following the spill. Wilds stocks most impacted by the *Exxon Valdez* oil spill are also subject to excessive exploitation in mixed stock fisheries of western PWS which are targeting on large hatchery returns. Furthermore, coded-wire tag recovery results from Natural Resource Damage Assessment (NRDA) Fish/Shellfish Study #3 and Restoration Studies #9 and #60B indicate that injured wild salmon streams located on hatchery stock migratory corridors in western PWS experience a high incidence of genetic interchange as a result of straying from the burgeoning hatchery populations. Ample evidence in the literature suggests that hatchery fish can be poorly adapted to wild conditions and that genetic interchange between hatchery and wild stocks may lead to reduced fitness of wild stocks. The combined effects of oil exposure, excessive harvest, and genetic burden on wild fish may result in an overall reduction in population size,

genetic diversity, and fitness of PWS salmon populations.

PROJECT DESCRIPTION

This project will consist of field studies which provide accurate estimates of hatchery pink salmon straying rates into wild salmon streams and straying rates between wild salmon populations in PWS. Data for straying of wild pink salmon are contingent upon funding of proposed Restoration Study #94185 (Coded Wire Tagging of Wild Stock Pink Salmon in Prince William Sound). This project will also collect a portion of samples to be used to identify and monitor the genetic structure of pink salmon populations. Analysis of the genetics samples will be completed by the proposed Prince William Sound Pink Salmon Stock Genetics Project (#189).

A. Resources and/or Associated Services

This study is directed at PWS wild pink salmon *Oncorhyncus gorbuscha*. The project may result in altered hatchery release strategies in PWS fisheries and will contribute to the natural recovery process for PWS pink salmon populations. Straying data will be used in conjunction with genetic data to develop alternate hatchery production strategies to reduce hatchery straying into wild spawning areas and develop criteria for wild stock sanctuary areas where straying is already minimal or does not occur.

B. Objectives

1. Sample approximately 75 percent of the salmon carcasses in 120 pink salmon spawning streams for coded-wire tag recovery.

2. Estimate straying rates of hatchery stocks of pink salmon into wild pink salmon streams in PWS from coded-wire tag recoveries in wild pink salmon streams.

3. Estimate the straying rates of wild populations of pink salmon between streams from coded-wire tag recoveries in wild salmon in spawning streams.

4. Collect genetics samples for a pink salmon genetic monitoring project.

5. Use straying and genetics data to define the stock structure of pink salmon and assess the genetic risks associated with large scale hatchery releases.

6. Write a final report which summarizes straying rates of hatchery and wild pink salmon populations, summarizes the spatial distribution of hatchery and wild pink salmon strays, reports the total contribution of hatchery strays to spawning escapements in wild pink salmon streams, synthesizes straying and genetic data in a discussion of probable stock structure models for pink salmon populations, and discusses the relevance of straying and genetic data with respect to wild stock fitness, hatchery release policies, and fisheries management strategies.

C. Methods

Pink salmon carcasses will be sampled for coded-wire tags in approximately 120 spawning streams. Tag recoveries will be accomplished by 7 two-person crews which conduct ground surveys on approximately 120 pink salmon spawning streams. Crews will be housed on the Alaska Department of Fish & Game (ADF&G) R/V *Montague* and one additional chartered vessel. Crews will access streams using small skiffs. Streams will be surveyed once per week during periods of peak salmon returns. All carcasses will be enumerated and examined for the absence of an adipose fin which denotes the possible presence of a coded-wire tag. Heads from fish with the adipose fin missing will be sent to the ADF&G Coded-Wire Tag Lab in Juneau for tag extraction and decoding. All carcasses will be marked to avoid duplicate counting and examination on subsequent surveys. Data from decoded tags will be used to estimate the straying rates of tagged stocks and the contribution of straying hatchery and wild fish to wild stock escapements.

Tissue samples for genetic analyses will be taken from live, spawned out fish in a representative subset of the surveyed streams. Proposed Restoration Study #94189 (Pink Salmon Stock Genetics) will process genetics samples and use results to help define the genetic structure of pink salmon populations and identify reproductively isolated populations. Results of coded-wire tag recovery data will be analyzed and used with genetic data to identify areas with no evidence of straying which could be designated as genetic sanctuaries and could be protected by future management actions and altered hatchery release strategies. Those oiled areas with documented high levels of straying should be monitored to examine the long-term effects of straying and the resultant wild/hatchery salmon hybridization on the overall fitness of wild stock populations.

D. Location

This project will be located in PWS. It will benefit pink salmon resources in that area and the commercial fisheries which they support. Almost all project funds will be spent to support field studies based out of Cordova and will contribute to the economy of that community. Tags from heads removed during stream surveys will be removed and decoded by the ADF&G Coded-Wire Tag Laboratory in Juneau. Data analyses and reporting will be completed in Cordova with the guidance and assistance of ADF&G regional biometrics staff based in Anchorage.

E. Technical Support

The large data bases generated from these field studies will require computer and data archiving services comparable to those provided to the ADF&G by the NRDA F/S Study #30, including hardware support, programming, database design and management, database documentation, and data archiving.

F. Contracts

This project requires no professional service contracts. There are vessel and air charter contracts.

SCHEDULES

Dates	Activity	Logistics Needs
July-Sept 1994	Data collection from tag recovery activities	Vessel charter for tag recovery crews, vessel, and air charter for support
Sept-Nov 1994	Data analysis for 1994	
December 1994	Final Report for 1994	
July-Sept 1995	Data collection from tag recovery activities	Vessel charter for tag recovery crews, vessel and air charter for support
December 1995	Final Report for 1995	
July-Sept 1996	Data collection from tag recovery activities	Vessel charter for tag recovery crews, vessel and air charter for support
June 1997	Final Project Report	

EXISTING AGENCY PROGRAM

Estimates of overall straying rates into PWS wild streams will ultimately incorporate aerial estimates of escapement to those streams. Aerial data for PWS pink salmon streams are collected annually by ADF&G at a cost of approximately $23.0K as part of their funded pink salmon management program. This survey program has been supplemented in recent years by approximately $5.0K donated by local fish processors and commercial fishing groups. Coded-wire tags to be recovered from hatchery fish which stray into wild streams are applied annually by Prince William Sound Aquaculture Association at a cost of approximately $120.0K and by Valdez Fisheries Development Association at a cost of approximately $40.0K.

ENVIRONMENTAL COMPLIANCE/PERMIT/COORDINATION STATUS

The ADF&G already has Title 16 permits for all of the streams proposed for tag recovery surveys. Corp of Engineers permits are not required since no structures will be constructed and none of the streams are navigable. All sampling on anadromous systems is covered by

an ADF&G biological collection permits.

The National Oceanic and Atmospheric Administration (NOAA) is lead Federal agency for National Environmental Policy Act (NEPA) compliance for this project. This project meets NOAA agency requirements for Categorical Exclusion from the NEPA process.

PERFORMANCE MONITORING

Personnel policy, purchasing practices, field camp operations, safety procedures, and project administration will be in compliance with the ADF&G Division of Commercial Fisheries Management and Development Standard Operating Procedures Manual. Data collection procedures are similar to those used in NRDA F/S Study #3 and Restoration Studies #9 and #60B. These procedures have been thoroughly reviewed by the ADF&G biometrics staff and the NRDA peer review process and approved by the Restoration Team.

Results of field studies in the summers of 1994 and 1995 will be reported in final annual reports in December of 1994 and 1995. A final project report which summarizes 1996 results and synthesizes results from all three years will be completed in June of 1997.

FY94 BUDGET ($K)

AGENCY	ADF&G
Personnel	
Travel	
Contractual	
Commodities	
Equipment	
Capital Outlay	
Sub-total	0.0
General Administration	
TOTAL	0
NEPA COMPLIANCE	0.0

This page intentionally left blank.

EXXON VALDEZ OIL SPILL PROJECT DESCRIPTION

Title: Institute of Marine Science - Seward Improvements

Project Number: 94199

Lead Agency: ADF&G

Cooperating Agencies: NOAA and DOI-FWS

Project Cost, FY94: $200.0K ADF&G, $0.0K ADNR

Project Startup Date: February 1994 **Duration:** 4 years

Geographic Area: Spill Area

INTRODUCTION

Purpose of Improvements to Institute of Marine Science at Seward

The primary purpose of improving the facilities of the Institute of Marine Science (IMS) at Seward is to provide the required infrastructure for the Trustee Council to conduct appropriate research and monitoring relating to injured marine mammals, marine birds, and their habitat. Additionally, the improvements will serve as a center for the coordination and integration of the comprehensive research and monitoring of the ecosystem affected by the Exxon Valdez oil spill (EVOS) with the goal of benefiting the long term health and restoration of injured resources and services.

The improvements are intended to help focus and carry out a long term research and monitoring program for the EVOS area. This will be accomplished through two objectives: 1) programmatically coordinating EVOS related research and monitoring among existing coastal research facilities, and 2) improving existing IMS research facilities in Seward to augment capabilities that do not currently exist elsewhere, principally for studies on marine mammals and marine birds. In meeting the second objective, there is an opportunity to supplement and complement state criminal settlement funds totalling $12.5 million for a Seward Sea Life Center and potentially some $3.2 million for an Alaska Shellfish Hatchery and Technical Center. Additionally, there is an opportunity to support the long term costs of operating improved research facilities in Seward with revenues derived from public education and tourism. Guidance for this project is contained in the EVOS Memorandum of Agreement and Consent Decree and the Draft EVOS Restoration Plan.

The Seward improvements are intended to address among other things: 1) long term monitoring, research, and rehabilitation needs for the EVOS, 2) enhancing the capabilities of available infrastructure to meet those needs, and 3) coordinating the programs for monitoring and research at the various research facilities with existing responsibilities in the EVOS area.

Existing Marine Science Program at Seward

The University of Alaska Fairbanks (UAF) , Institute of Marine Science (IMS) carries out its shore based activities in Seward. The Seward Marine Center facility has been operational since 1970. The program consists of vessel operations, research, and education. The state's only oceanographic vessel the R/V *Alpha Helix* (133') operates from Seward and supports most of the oceanographic research done in the Gulf of Alaska and Bering Sea. The National Science Foundation is currently designing an ice breaker (330') that will operate from Seward and provide access to the Arctic Ocean. A variety of small vessels (< 30') are available for local research. The facility has warehouse and docking facilities, machine shop, and staff to support oceanographic vessels.

The laboratory at Seward has the only running seawater system in the northern Gulf of Alaska region and a variety of marine biological and medical research is undertaken through the University research and graduate student training program. The areas of study include oceanography (physical, chemical, biological), marine biology, physiology, and ecology. The UAF medical program uses the Seward facility to conduct their joint UAF-Russia medical research projects. The Seward Area Native Association is actively involved in shellfish aquaculture at the laboratory and the Alaska Department of Fish and Game is conducting a siting study for the Alaska Shellfish Hatchery and Technical Center that may lead to establishing a shellfish research laboratory and hatchery on the site.

The current IMS facility has two marine science laboratories including the Hood physiology and medical research lab (4,000 sq. ft.) and the Marine Biology Lab (1,540 sq. ft.). An educational program is operated from the Rae Public Education Building (5,000 sq. ft.). This public service program disseminates the results of marine science research to the public, science educators, policy makers, and researchers from other institutions.

Monitoring and Research Functions

The proposed improvements to the Institute of Marine Science in Seward provide the required infrastructure needed to carry out monitoring and research functions related primarily to injured marine mammals and marine birds. The project has the unique ability to fill these needs because of: 1) ready access to the state's population centers and the spill area, 2) the opportunity to improve an existing marine science institute with over twenty-three years of operating experience, 3) the unique research and monitoring functions supported by the improved institute, and 4) the opportunity to lower the cost of research and thereby attract and sustain long-term research activity by offsetting operational costs with visitor generated revenues.

The following are examples of research and monitoring gaps that the proposed IMS improvements are uniquely suited to address:

Integration and Modeling Program

- Ecological relationships
- Food webs
- Synthesis, gap analysis, forecasting
- Specialized library and database

Description of specific improvements for equipment and facilities

The institute would assist with comprehensive data integration and modeling of the ecosystem in the EVOS region. The IMS program will be integrated with existing monitoring and research activities by agencies and other groups, but it will not duplicate or replace them. A major task will be to help organize and synthesize existing abiotic and biotic information from relevant EVOS damage assessment, restoration, and other studies. Information will be cataloged and maintained in an EVOS Restoration Library which will specialized in acquiring and making accessible materials that are appropriate for conducting research and monitoring of injured resources and the ecosystem. In addition, the Restoration Library would assist in the task of information integration by developing a restoration database and tracking of current research. The institute would develop an ecosystem modeling program designed to organize and analyze ecological information about injured species. Additionally, modeling would assist with developing consistent protocols and techniques that can be used to forecast changes and identify data gaps.

The institute will actively engage in synthesizing and disseminating information concerning its research and the status of the ecosystem in the EVOS region. This will be accomplished through scientific publications, bulletins, newsletters, and on-line services.

Oceanography and Marine Ecology

The institute could provide several critical oceanographic services to the EVOS region that are not currently available. A program of basic physical oceanography measurements including temperature, salinity, nutrients, and currents would be integrated among resource agencies, academic institutions, and private entities. A long term phytoplankton and zooplankton monitoring program would provide information on primary and secondary production, plankton composition, and biomass for the EVOS region. These oceanographic data are critical to our understanding of factors affecting the ecosystem in the EVOS area and the recovery of injured resources. Oceanographic information would be synthesized and maintained in a database that will be accessible to all organizations.

- **Seward Line oceanographic baseline.** The Seward Line which extends from Seward to Middleton Island is the longest periodically monitored oceanographic baseline in the Gulf of Alaska. Since 1970, this line has been periodically sampled for physical oceanographic measurements including salinity, temperature, and currents. In 1990 Seward was picked as a NOAA Global Climate Change Site; each month the first four stations of the line are sampled for the above physical parameters. This NOAA project is designed to operate for the next 74 years. With improved facilities and program support, there is an opportunity to build on this baseline to obtain additional fine scale (spatial and temporal) oceanographic data for the Northern Gulf of Alaska, including phytoplankton and zooplankton (including larval fish) composition and biomass. The C-Lab buoy in Prince William Sound provides the only periodic measurement of primary productivity in the EVOS area and there are no periodic measurements of secondary productivity outside of nearshore zooplankton sampling near Prince William Sound hatcheries. Enhancing the oceanography database with basic productivity measurements is critical to developing a comprehensive ecosystem monitoring program for the EVOS area..

- **Marine ecology.** Research on the biology and ecology of forage fish and other non-commercial species including population monitoring, food web interaction, and health studies could be accomplished with hydroacoustic and Acoustic Doppler Current Profiler measurements, combined with net sampling. This would provide regular biomass estimations that are critical to understanding factors affecting the status of marine mammals, marine birds, and other injured resources. These data could be collected in conjunction with the previously described Seward Line sampling at minimal additional cost.

Intertidal/Subtidal Habitat

- Intertidal/subtidal community composition and biomass

- Intertidal/subtidal community health

The institute could assist with two key elements of intertidal/subtidal habitat in the EVOS area. Information on the distribution, composition, and relative abundance of key intertidal and subtidal organisms would be collected and synthesized. A database would be maintained on the location and status of key coastal habitats including estuaries, kelp beds, seagrass beds, mussel and clam beds. Reference stations would be monitored in the EVOS area to determine baseline conditions, recovery, and seasonal and long-term population/composition trends. Laboratory plant/animal research would help detect factors influencing the health of intertidal/subtidal communities including natural and man-induced perturbations, parasites, disease, and recruitment. Rehabilitation of injured clam and mussel populations could be supported by the potential co-location of the Alaska Shellfish Hatchery and Technical Center.

Fish/Invertebrates

- Fish/invertebrate health
- Food habits
- Population and reproductive status

The institute could assist research in several critical areas of the biology and ecology of fish and invertebrates with emphasis on injured species and associate prey (macro-zooplankton, forage fishes). Collaborative work with state and federal resource agencies (primarily ADF&G and NMFS) and other coastal research facilities could undertake a combination of population, food web interaction, and health studies to help compile a long term database on ecologically important taxa. The institute would help to synthesize data from in-house research and other sources, and disseminate that information to other organizations. Improved wet-laboratory and tank facilities would allow for controlled studies on fish and invertebrate bioenergetics, reproduction, and disease.

Marine Mammals

- Population and reproductive status
- Marine mammal health
- Food habits
- Live animal studies (physiology, pathology)
- Rehabilitation

The institute would address five critical areas of marine mammal research and monitoring while focusing on recovery of injured species. These include conducting research on population and reproductive status by collaborating with management agencies (NMFS, USFWS, ADF&G) and by helping to relate population trends to changes occurring in the ecosystem. The institute would conduct primary work on marine mammal health issues involving research on disease states, contaminants and potential food competition. This would include work on food habits such as daily nutritional requirements, prey preferences, the energetic costs of living at sea, and how much food is required to support whole populations. The institute would conduct carefully controlled studies on animals held at the facility to define physiological and health status, and adaptations to environmental conditions. The institute could help to maintain a regional stranding network for marine mammals. Injured or sick marine mammals could be rehabilitated and returned to the wild when it would benefit the recovery of marine mammal populations. Additional unique attributes of the proposed institute are as follows:

- **Marine mammal food requirements, growth, medical problems.** There are currently no facilities north of California for conducting work on marine mammals including harbor seals and sea otters under controlled laboratory conditions. While field research is essential to understanding the ecosystem health status of marine mammals such as population trends and feeding grounds, there are also critical issues affecting marine mammals that can only be conducted under controlled conditions such as food requirements, growth rates, medical problems, and heat control under stress. Field and laboratory work must be conducted hand in hand to really answer basic biological issues concerning injured marine mammals.

- **Attracting new and innovative research on marine mammals.** Because it would be among the only cold water facility of its type in the world, the proposed institute would attract new and innovative research to benefit the restoration of injured marine mammals. The availability of visitor generated revenues to defray the operational costs of the institute would be an important factor in helping to reduce the cost of long-term research programs. Similarly, cooperative research with scientists from agencies, academic, non-profit, and private organizations would improve overall research efforts. There would also be opportunities for student and graduate research. The following internationally recognized marine mammal research scientists have expressed an interest in conducting work at the proposed institute:
  - Dr. Dan Costa, Office of Naval Research
  - Dr. Ian Boyd, British Antarctic Survey
  - Dr. Leo Ortiz, University of California, Santa Cruz
  - Dr. Randall Davis, Texas A&M University
  - Dr. Gerald Kooyman, Scripps Institute of Oceanography
  - Dr. Michael Fedak, Sea Mammal Research Unit, England
  - Dr. Robert Elsner, University of Alaska, Fairbanks

  The following is a list of research projects that these and other scientists have suggested would be conducted at the proposed institute:
  - Thermoregulation in cold water
  - Food requirements of ice seals
  - Medical profiles of pups, juveniles, and adult seals
  - Body shape and hydrodynamics
  - Exercise requirements of cold water seals
  - Relationships of fat metabolism to consumption by Natives
  - Biomedical problems related to diving physiology
  - Fasting and starvation biochemistry
  - Development of remote sensor systems
  - Toxin and pollutant control studies
  - Development of immunology
  - Mother-pup nourishments requirements

- **Rehabilitation of injured marine mammals.** Although there are provisions for caring for abandoned and injured marine mammals at several facilities, there are currently no research facilities in Alaska dedicated to the rehabilitation of sick or injured marine

mammals. The proposed institute would provide facilities and staff for rehabilitating sick or injured marine mammals including sea otters and harbor seals in the Northern Gulf of Alaska region. Perhaps more importantly, the facility would have capabilities to study causes and appropriate treatments for marine mammal injuries and disease. Animals which were returned to health could be released back to the wild. Additionally, the institute would be equipped to properly necropsy dead marine mammals which routinely wash ashore; this would improve our understanding of mortality factors affecting marine mammal populations. A focused rehabilitation and research program involving marine mammals may provide important information on causes of their continuing decline. This could also help to generate appropriate techniques to aid their recovery.

Marine Birds

- Population and reproductive status
- Avian health
- Food habits
- Live animal studies (physiology, pathology)

Work at the institute would focus on four critical elements of avian biology. First, in coordination and collaboration with federal and state agencies, staff could assist with population and reproductive studies of bird species in the EVOS area. Research would focus on the relationship of bird population and reproductive trends to their environment, and would help to synthesize and disseminate information from these studies. The institute would have facilities that could conduct basic research on avian health including individual birds and, perhaps more important, address population health by looking at levels of contaminants, disease state, and body condition of wild species. Research on injured or sick birds would focus on animal health and wildlife diseases with the goal of helping to rehabilitate and restore injured species. Research programs will also focus on the important area of food habits by studying the dietary requirements and limits of critical species. Work with live birds in holding tanks, aquaria, and research habitat would enable detailed controlled laboratory and experimental studies in energetics, physiology, and animal health that would help to understand natural recovery in the EVOS area. Additional unique attributes of the proposed institute are as follows:

- Investigations of seabird die-offs. Seabird die-offs occur periodically in the Gulf of Alaska. Understanding the cause of die-offs could be very important to restoration efforts for injured resources and the overall health of the ecosystem. Currently, there are inadequate facilities and programs for investigating seabird die-offs. For example, during the winter of 1993 thousands of dead and moribund common murres came ashore in Seward and other Kenai Peninsula locations. During the die-off the Seward Harbor contained an extraordinary biomass of overwintering juvenile herring that

provided an easily exploitable prey base for the murres, yet many birds inexplicably died anyway. Because of the lack of appropriate facilities and staff in Alaska to hold and study the murres, there were no opportunities to properly evaluate the cause(s) of the die-off. Although the die-off was officially attributed to starvation (do to the emaciated condition of the birds), its cause and relationship to murre restoration efforts and overall ecosystem conditions could not be determined within existing facilities and programs.

- **Treatment and rehabilitation of injured marine birds.** In addition to large seabird die-offs, marine birds including murres, black oystercatcher, pigeon guillemot, harlequin duck, and marbled murrelet may require treatment for injuries suffered from nets, oiling, gun shots, collisions, disease, and other causes. A marine bird rehabilitation facility with the proposed life support system could aid in the recovery of these injured species. Additionally, the treatment and rehabilitation of injured marine birds at a research facility provides opportunities for increasing our understanding of avian health specifically as it relates to injured species and determining appropriate restoration techniques that could be applied to wild populations.

- **Marine bird diet, growth, and behavior.** There are currently no facilities in Alaska to support studies on the diet, growth, and behavior of marine birds including murres, pigeon guillemots, black oystercatchers, marbled murrelets, and harlequin ducks in a controlled research environment. Research using the capabilities of the proposed facilities could improve our understanding of marine bird foraging and reproductive behavior, growth, diet, and physiology. This information would be applicable to understanding the recovery of injured species and in determining appropriate restoration strategies. For example, the recovery of harlequin ducks may be dependent, in part, upon determining how physiological changes that result from a diet of oiled prey affect their reproductive success. Research in a controlled environment with harlequin ducks may provide answers to their recovery that could not otherwise be obtained.

Research Submersible and Support Vessel

- Research submersible (400 meter depth capability)

- Research vessel/sub tender (130 foot rig tender design)

Proposed improvements to facilities in Seward would accommodate the basing of a research submersible and vessel/tender for work in the EVOS area. Submersibles are becoming increasingly valuable for marine research and would enhance the work of the institute and other State, Federal, and private research entities particularly in studies of fish, marine mammals, birds, invertebrates, and benthos. Certain types of marine research can only be conducted using a submersible. Presently, the nearest available submersible is located in California and must be ferried to and from Alaska. A research submersible and vessel which would support work throughout the EVOS area could be obtained at a reasonable cost.

The support vessel/tender would provide a research platform for all appropriate EVOS monitoring and research projects. Currently, the R/V *Alpha Helix* is scheduled to be retired in the year 2000 and there is a need for a replacement oceanographic research vessel to support programs in the Gulf of Alaska. It is expected that the operational cost of the proposed vessel/tender will be substantially less than what is currently charged for the *Alpha Helix*. This would increase the cost effectiveness of future EVOS monitoring and research. Additionally, there is an opportunity to further offset approximately one-half of the cost of purchase and operation of a vessel targeted for research in the North Pacific through coordination with the University National Oceanographic Laboratory System.

The following is a description of relevant research and monitoring activities that could be undertaken by a research submersible (the vessel/tender would provide a platform for many other EVOS projects):

1. Assess physical and biological factors that affect productivity, recruitment, growth, and survival of species that are linked by food webs to injured resources in the pelagic and nearshore environments

2. Investigate linkages between pelagic and benthic food webs in the EVOS area.

3. Support field studies assessing basic biological processes including mating, rearing, molting, predation, and species' interactions.

4. Conduct studies of fish and invertebrates in ecologically sensitive benthic and nearshore habitats, and in protected areas to assess spill impacts and other human-induced factors which might be affecting the recovery of injured species. For example, investigations of species diversity and composition in waters that are closed to trawling and other fishing activities (such as the vicinity of sea lion rookeries) may provide important insights into external factors affecting recovery of injured marine mammals and seabirds.

5. Assess abundance and distribution of benthic resources in high relief nearshore environments which are difficult to sample with conventional gear. For example: demersal shelf rockfish and other rockfish; assess important bottom habitat including boulder piles, pinnacles, and live bottom environments (corals, kelp, etc.)

6. Investigate human induced factors affecting key species and benthic habitats including impacts from fish and shellfish harvesting (trawling, longlines, scallop dredging) and processing (disposal of fish wastes).

Improvements to Institute of Marine Science at Seward Project Budget

The proposed improvements at Seward are to be located adjacent to the existing campus of the Seward Marine Center of the University of Alaska, Institute of Marine Science (IMS). The Seward improvements will consist of nearly 39,000 square feet of interior space made up

primarily of laboratories, staff offices, computer work stations, and building support systems for the study of the marine mammals and marine birds affected by the 1989 Exxon Valdez oil spill (EVOS).

There will also be 50,000 square feet of exterior space containing outdoor research habitat for those marine mammals and marine birds that are being studied. The research habitat will include tanks for pinnepeds and sea otters, and aviary for the study of marine bird species. The outdoor and indoor live tanks and research habitat will be supported by an extensive life support system using sea water from Resurrection Bay.

The Seward improvements will also accommodate the basing of a research submersible and support vessel for conducting research and monitoring in the EVOS area.
Description of Research Cost Categories: Equipment and Facilities

Research Equipment

Life Support System:

The Life Support System(LSS) will supply seawater similar to natural conditions for the support of the live tanks, live pools, wet laboratories and the research habitat. The seawater will be free of debris, pathogenic bacteria and viruses in compliance with regulatory requirements and industry established standards. The inflow and outflow system will be sized to circulate up to 35 MGD from Resurrection Bay. The LSS will be a flow through system using low pressure sand filtration process with ozonation used for disinfection and water quality enhancement as required. The budget for the LSS includes pumps, piping, valves for intake, discharge and circulation, the filtration system, ozone generation system and emergency circulation.

Live Tanks and Pools:

A variety of tanks and pools will be provided for marine mammal and bird research. The tanks and pools will be located on the exterior, but will be sheltered from the elements. The pools and tanks will be designed to exceed regulatory requirements and industry established standards. The live tanks will consist of a number of round, "ring" tanks varying from 50 to 20 feet in diameter and rectangular tanks from 20 feet square to 10 feet by 15 feet. The depths will vary from 5 feet deep to 15 feet deep. The live research pools will be rectangular and will vary from 4 feet to 8 feet deep.

Research Habitat

The Research Habitat will provide for the long term care for those marine mammals and birds involved in specific research programs. It will, to the appropriate extent, duplicate the natural environment for proper husbandry and behavioral studies. The Habitat will house sea otters, seabirds and pinnepeds. It will consist of wet pools, dry haul out and resting areas. The marine bird habitat will allow for perching, nesting

and swimming. The natural setting will be designed and constructed to exceed existing regulatory requirements and industry established standards. The habitat will include provisions for the separation for the species groups and specific individual animals.

Laboratory Equipment

The laboratory equipment, fixtures and furnishings component will serve the research labs, ecological modeling lab and the EVOS Library/ Repository . It is inclusive of the lab benches and cabinetry, office furnishings, shelving and office equipment, sinks, gases and sea water service, the fixed and loose equipment such as balances, scales, centrifuges, various metering and analyzing devices, fume hoods, hydro-acoustic systems, video equipment, computers and printers, modem, microscopes, autoclaves, freezers, transport cages, hoists, dollies, tanks, and oceanographic equipment.

Research Facilities

Site work

The Site work will include the provision of site access, parking, outdoor research areas, the wave barrier and landscaping. The overall site work effort will consist of stone removal, rough grading, demolition of obstructions, the removal of hazardous materials, de-watering, fire main relocation, fire and water service, electrical and gas service and storm drainage.

Building Construction

The building to be constructed will house the wet and dry laboratories for research, office space and work areas for scientific, curatorial and administrative staff and support space for the mechanical and life support systems. The facilities construction effort will include the foundations, substructure, structure, exterior construction, roofing, interior construction, vertical circulation, mechanical and electrical systems.

Key Permits and Agency Reviews

Federal

1. Corps of Engineers
   Section 10/104 Permit to discharge fill.

2. Environmental Protection Agency
   NPDES Permit to discharge wastewater

3. National Environmental Policy Act (NEPA)
   Environmental Assessment

4. National Marine Fisheries Service
   Marine Mammal Permit

5. Fish and Wildlife Service
   Migratory Bird Permit
   Marine Mammal Permit

State of Alaska

1. Division of Government Coordination
   Alaska Coastal Management Program Consistency Determination

2. Alaska Department of Environmental Conservation
   Water Quality Assurance
   Hazardous Materials Site Plan Review
   Storm Drainage Review

3. State Fire Marshall
   Life and Safety Plan Check

Kenai Peninsula Borough (KPB)

Consistency with KPB Coastal Management Plan

City of Seward

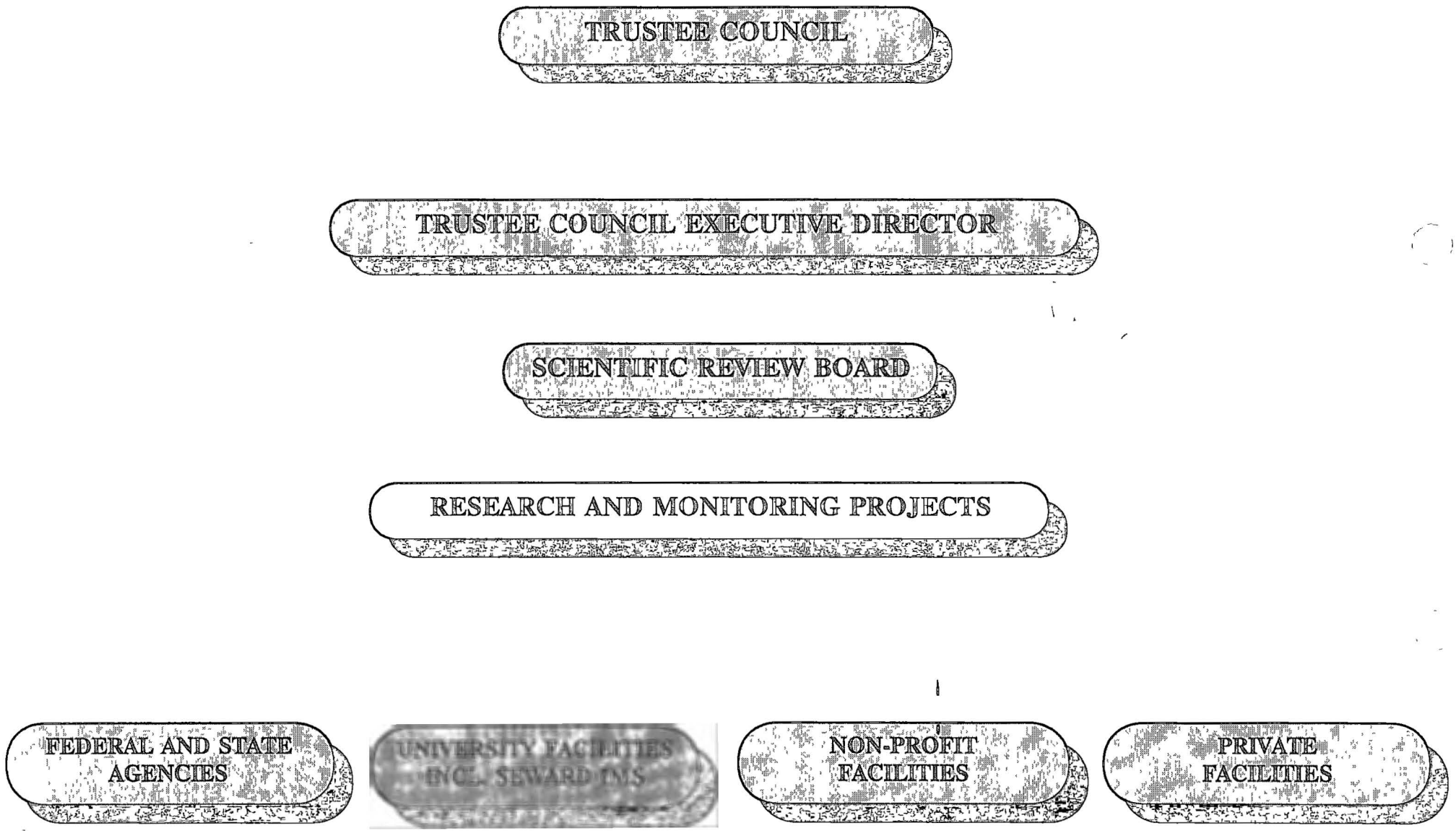
1. Platting and Zoning Conformance
2. Public Utility Approval
3. Conditional Use Permit
4. Uniform Building Code: Building Permit.

Opportunities for Cooperation Between Seward IMS and other Coastal Marine Research Facilities

The diverse natural resources and human uses of the Gulf of Alaska demand a wide range of research and management capabilities. There are currently some fourteen coastal marine research facilities with research and monitoring responsibilities in the EVOS area. Achieving the goal of an ecosystem based monitoring and research program for the EVOS area will require the cooperation and coordination of all appropriate federal, state, non-profit, and private organizations. The proposed Institute of Marine Science (IMS) facilities at Seward are planned as a center for research and monitoring related to recovery of marine mammals, marine birds and their supporting ecosystem. The proposed improvements would provide unique abilities for conducting research and monitoring that currently can not be accomplished as well at other existing coastal marine research facilities. It is not the intent

of the Seward IMS facility to conduct nor direct all EVOS related research and monitoring. Research efforts at the institute will occur within the context of an overall ecosystem-based research and monitoring plan that presumably will take advantage of the unique capabilities, efficiencies, and geographic advantages of all appropriate research facilities and organizations. On the following page is a proposed organization diagram showing the relationship of the Seward IMS to other facilities and organizations.

Proposed Organization



FY94 BUDGET ($K)

AGENCY				
Personnel				
Travel				
Contractual				
Commodities				
Equipment				
Capital Outlay				
Sub-total	0.0	0 0	0.0	0.0
General Administration				
TOTAL	0	0	0	0

NEPA COMPLIANCE

EXXON VALDEZ OIL SPILL PROJECT DESCRIPTION

Title: Prince William Sound Area Recreation Implementation Plan

Project Number: 94217

Lead Agency: USDA-FS

Cooperating Agency: ADNR

Cost of Project, FY94: $91.2K **Cost of Project, FY95:** $0.0K

Project Startup Date: October 1993 **Duration:** 8 months

Geographic Area: Prince William Sound

INTRODUCTION

This project is the continuation and completion of project 93065-Prince William Sound Recreation. The objectives of the project are to develop a list of prioritized recreation restoration projects, identify and describe potential special designations, and identify real or perceived injury to the recreation resource and services in Prince William Sound (PWS). Restoration management goals and objectives for recreation in PWS will also be developed based on injuries identified. This project is currently in the public participation stage with additional public participation and meetings planned through November, 1993.

PROJECT DESCRIPTION

A. Resources and/or Associated Services

This project is focused on restoration of recreation. The most significant part of this project will identify, prioritize, and describe potential recreation restoration projects through public participation. Meetings with interested groups and individuals have taken place with additional meetings scheduled through mid-September. A workshop is planned for November 5 and 6, 1993, which will bring all interested parties together to develop a project list. Evaluation criteria have been developed for use at this meeting to rate and prioritize projects. Additional meetings are being scheduled in the Anchorage area.

In addition to developing projects, potential areas requiring special designation are being identified. A preliminary list of possible designations has been developed. During public meetings, comments about special designations are being gathered. The final project report will include the findings of the special designation research.

A specific statement of injury to recreation in PWS will be developed. This statement will be used as the basis for future recreation restoration activities. Currently, the project has identified existing management goals and objectives from public land management plans. These tend to be broad in scope and not specific to recreation restoration.

B. Objectives

The objectives of this project remain the same as in 1993, with only slight modification in emphasis:

1. Develop recreation resource and service projects for FY 1994 and beyond that can be implemented by the Trustee Council for restoration in PWS. An initial list of projects with complete project descriptions will be provided by November 22, 1993 for inclusion in the FY94 Work Plan. Additional projects will be identified, prioritized, and listed in the final project report.

2. Identify all possible special designations that could be applied to PWS. This would include State, Federal or other yet unknown designations. A preliminary draft of possible special designations will be available September 30, 1993 with the summary of findings included in the final project report.

3. Identify the real or perceived injury to recreation in PWS and develop long-term recreation restoration goals and objectives for the management of PWS. A statement of the injury to recreation will be completed. Goals and objectives will be identified in the project report.

C. Methods

The methods described in the 1993 project description (93065) are being implemented. A mass mailing was sent out in early June to inform people of the project and begin the process of soliciting comment and project ideas. In Addition, people were asked if they would like to fill out the *Exxon Valdez* Restoration Plan Recreation Questionnaire. Returned questionnaires have been added to the data base. Public meetings soliciting ideas from people on possible recreation restoration projects are ongoing with meetings planned through September. Initial work has been done to develop the special designations report and identify recreation restoration management goals and objectives. Information collected at each public meeting is being recorded and will be summarized before the workshop in November and for the project report.

The implementation phase of projects for recreation restoration will not be managed by this project work group. After the November workshop, project descriptions will be prepared for the highest rated projects and submitted to the Trustee Council by November 22, 1993. All other projects and the final project report will be submitted by April 15, 1994. The Trustee Council will decide which, if any, of the restoration projects identified will be funded.

D. Location

Meetings are being held in all communities in PWS as well as Seward and Anchorage. Additionally, meetings with individuals or groups are being held at locations most convenient to them, although typically in Anchorage.

E. Technical Support

Technical support will be needed to input information from the recreation questionnaire and analyze questionnaire data. Support will also be needed from ADNR to develop working maps of PWS for use in meetings and for identifying and mapping potential project locations.

F. Contracts

Contractual funds will be utilized to provide charter aircraft for travel to villages in PWS, meeting space for the November 5-6 workshop, and a meeting facilitator for the workshop.

SCHEDULES

A schedule of the major milestones for project tasks, public meetings, analysis, and final reports is presented in Table 1. Initial data collection began in April, 1993. Meetings with the different interest groups began in June and will continue through September. A list of all the projects proposed by the public will be prepared for the November 5-6, 1993 workshop. Complete project descriptions for the best projects identified will be submitted by November 22, 1993 for the FY 94 Work Plan. All other projects identified will be listed and prioritized as a part of the project report, April 15, 1993. Investigations of possible special designations began in April, 1993. A preliminary draft of possible designations will be available the end of September, 1993. Complete findings and recommendations will be a part of the project report. Development of goals and objectives began in June, 1993. A statement of injury to the recreation resource and services will be completed in September, 1993. A summary of the findings related to injury and any restoration goals and objectives will be included in the project report.

Table 1. Project Schedule.

Date	Accomplishment
	Complete major collection of data, projects submitted, surveys, etc. Additional data collection will be ongoing as necessary.
June 1, 1993	Begin meetings with interest groups. Continues through October, 1993 Currently scheduled: July 21-23 Valdez July 27 Chenega Bay August 6 Seward August 10-11 Cordova August 16 Whittier August 24 Tatitlek
September 1, 1993	Draft statement of injury to recreation resources and services of PWS
September 30, 1993	Final statement of injury to recreation resources and services of PWS
October 1, 1993	Draft management goal and objectives for PWS
October 30, 1993	Preliminary list of project proposals and descriptions
November 5-6, 1993	Workshop with all interested groups
November 22, 1993	Project descriptions for FY94 Work Plan
February 15, 1994	Draft Project Report for peer review
April 15, 1994	Final Project Report

EXISTING AGENCY PROGRAM

The State of Alaska Department of Natural Resources has been funded for $4.75M of the criminal settlement to conduct recreation restoration activities within the spill area. The Chugach National Forest manages PWS with primary management emphasis on recreation and fish and wildlife management. Cabin maintenance, trail maintenance and development, mooring buoy placement, and cultural resources site identification, protection, and interpretation are some of the major tasks performed each year. The Forest Service has allocated approximately $90K per year for the management of recreation within PWS. Additional funds have been allocated for fish and wildlife management. The Chugach National Forest Land Management Plan is scheduled for revision starting in 1995, and goals and objectives identified

by this project may be adopted in the revised plan.

ENVIRONMENTAL COMPLIANCE/PERMIT/COORDINATION STATUS

This project is categorically exempt from formal documentation in an environmental assessment or environmental impact statement under Forest Service regulations [FSH 1909.15 31.1a(3)]. No other permits are required. No ground disturbing activity is proposed. This project is for recreation implementation development. Projects developed from this project may require environmental analysis or permits before implementation.

PERFORMANCE MONITORING

Products provided from this project include:

1. Complete project descriptions for the most desirable recreation restoration projects for the FY 1994 Work Plan, based on the public involvement process being used.

2. A final project report describing the process followed, contacts made, workshop results, possible special designations, and a listing of all projects identified by priority.

3 A statement of injury to the recreation resource and services of PWS.

FY94 BUDGET ($K)

AGENCY	USFS	ADNR	TOTAL
Personnel			0.0
Travel			0.0
Contractual			0.0
Commodities			0.0
Equipment			0.0
Capital Outlay			0.0
Sub-total	0.0	0.0	0 0
General Administration			
TOTAL	0	0	0

NEPA COMPLIANCE 0.0

EXXON VALDEZ OIL SPILL PROJECT DESCRIPTION

Title: Harbor Seal and Sea Otter Co-op Subsistence Harvest Assistance

Project Number: 94244

Lead Agency: ADF&G

Cooperating Agency: None

Project Cost, FY94: $54.5K ADF&G

Project Startup Date: October 1993 **Duration:** 3 years

Geographic Area: Prince William Sound and the Lower Kenai Peninsula

INTRODUCTION

The populations of harbor seals and sea otters in Prince William Sound (PWS) and adjacent waters were injured as a result of the *Exxon Valdez* oil spill. The U.S. Fish and Wildlife Service estimates that between 3,500 and 5,500 sea otters were killed by oil in the first months after the spill, and sea otters were still being injured by oil in the environment three years later. The case for a population level oil spill injury to harbor seals is less clear. Harbor seal populations throughout the Gulf of Alaska are known to have been in decline before the spill. This decline continues, but it is difficult to determine how much, if any, is due to the effects of oil. However, it is known that harbor seals were exposed to *Exxon Valdez* crude oil in PWS. It is estimated that 345 harbor seals suffered direct mortality. Harbor seals also suffered sub-lethal effects, including mild corneal damage, nerve damage, and brain lesions.

Many Native subsistence hunters within the spill area, concerned about the apparent decline in the numbers of harbor seals and sea otters, have voluntarily reduced their take of these species in an effort to help their recovery. However, at present, there is no mechanism in place to evaluate the effectiveness of these efforts.

Some data are available on marine mammal harvests in the spill area. The Alaska Department of Fish and Game's (ADF&G) Division of Subsistence, has collected information on the numbers of harbor seals and sea otters harvested by subsistence users living in several communities in the spill region for both pre-and post-spill years. In 1993, the Division of Subsistence, in cooperation with the National Marine Fisheries Service (NMFS) and Ruralcap, also undertook a project to collect more detailed information on the timing and composition of subsistence harvests of harbor seals and sea lions (but not sea otters), including figures for those animals struck and lost. The USFWS operates a sea otter tagging program, which gathers information on sea otter harvests, including the location where animals are taken.

Some information is available on harbor seal and sea otter populations in this region. The ADF&G's Division of Wildlife Conservation, working with the NMFS, has conducted a count of harbor seals in both the oiled and unoiled areas of PWS, along with other research aimed at assessing the health of the harbor seals (Restoration Project Number 93046). The USFWS has continued to monitor the recovery of sea otters in oiled areas by determining their abundance, distribution, and mortality (Restoration Project Number 93043).

This project will: (1) compile all of the available information; (2) gather additional data as needed; (3) analyze and interpret the data in cooperation with the appropriate agencies and native groups; and (4) produce a set of recommendations regarding harbor seal and sea otter harvesting to guide subsistence users who want to voluntarily change their harvesting practices to help these two species recover.

PROJECT DESCRIPTION

A. Resources and/or Associated Services

The goal of the project is to assess the impact of subsistence harvests of harbor seals and sea otters on the recovery of these species, and, if necessary, work cooperatively with subsistence hunters to find ways to reduce this impact.

B. Objectives

Produce a set of recommendations for subsistence users of harbor seals and sea otters by September 1994.

C. Methods

The project involves compiling information from a variety of sources. Sea otter tagging data collected by the USFWS will be used to estimate both the number of sea otters taken, and the locations in which they were hunted. The Division of Subsistence is already conducting a survey in the oil spill-impacted communities to gather information on the numbers of harbor seals harvested, including a breakdown by life stage and sex of the animal, and an estimate of the number struck and lost. A section would be added to the questionnaire on location of harvest for this species. This would also increase the length of time it takes to conduct each interview. Information collected by the ADF&G, the USFWS, and the NMFS on the biology and population characteristics of harbor seals and sea otters in the oil spill-impact area will also be used. The Habitat and Restoration Division will contract with a qualified organization, such as the Alaska Sea Otter Commission or Ruralcap, to assist in the interpretation of the biological and population data and to assess the potential effects of the harvest on the health of the populations.

When the data is compiled and analyzed, an ad hoc committee would be convened to evaluate the accumulated information and make recommendations to subsistence users.

Such a committee would be composed of representatives of appropriate agencies, including the ADF&G, USFWS, and NMFS, as well as native organizations, including the Alaska Sea Otter Commission, Ruralcap, the Chugach Regional Resources Commission, and the village and traditional councils of the area. Recommendations of the ad hoc group would be presented to subsistence users both in an informational newsletter, and in community meetings. Any changes to the harvest would be voluntary, as the ad hoc group would have no authority to compel any changes

D. Location

The study area will include PWS and the lower Kenai Peninsula.

E. Technical Support

None required.

F. Contracts

The analysis and interpretation of the biological and population data would be contracted to one or more qualified organizations, such as Alaskan Native organizations or the Alaska Sea Otter Commission because of their ties to the native communities.

SCHEDULES

May 1994:	Finish collection of harvest information for 1993
July 1994:	Finish compilation of biological and population data
August 1994:	Convene ad hoc group to evaluate data
September 1994:	Make recommendations to subsistence harvesters
	Produce informational newsletter
	Hold community meetings
	Submit final 1994 report

A second year of harvest monitoring and evaluation of new biological and population data will be needed to complete the project.

EXISTING AGENCY PROGRAM

This project will take advantage of several existing programs, both within the ADF&G and other agencies as outlined in the introduction to this project.

ENVIRONMENTAL COMPLIANCE/PERMIT/COORDINATION STATUS

The USFWS is lead Federal agency for National Environmental Policy Act (NEPA) compliance for this project. This project meets USFWS requirements for Categorical Exclusion from the NEPA process.

No permits are required.

PERFORMANCE MONITORING

A database will be compiled for this project. The ad hoc group will form a set of recommendations for subsistence users of the two species. An informational newsletter will be produced. A report will be completed at the end of each project year.

FY94 BUDGET ($K)

AGENCY	ADF&G
Personnel	32.0
Travel	5.0
Contractual	10.0
Commodities	2.0
Equipment	0.0
Capital Outlay	0.0
Sub-total	49.0
General Administration	5.5
TOTAL	54.5

NEPA COMPLIANCE 0.0

EXXON VALDEZ OIL SPILL PROJECT DESCRIPTION

Title: Sea Otter Recovery Monitoring

Project Number: 94246

Lead Agency: DOI-FWS

Cooperating Agency: None

Cost of Project, FY94: $418.7K **Cost of Project, FY95:** $70.6K

Project Startup Date: April 1994 **Duration:** 1 year

Geographic Area: Prince William Sound

INTRODUCTION

Sea otters (*Enhydra lutris*) are a well-known marine mammal species in Alaska. They historically occurred throughout coastal waters of the Pacific, but as a result of fur harvests in the 18th and 19th centuries, they came close to extinction. They have since increased in abundance and distribution, and presently are found in most coastal areas of southern Alaska. Sea otters prey on a variety of invertebrate species, including mussels, clams, crabs, and sea urchins.

Acute losses of sea otters associated with the *Exxon Valdez* oil spill probably ranged from 3,500 to 5,000 animals. Natural Resource Damage Assessment studies on (1) sea otter abundance in Prince William Sound (PWS), (2) age distribution of sea otter carcasses recovered in oiled areas, and (3) first-year survival of juvenile sea otters in PWS suggested that oil-related injury to the population persisted through 1991.

Data collection in 1992 was limited; however, age distributions of carcasses recovered in 1992 suggested mortality was returning to a pre-spill pattern. In addition, a juvenile survival study conducted by USFWS in 1992-93 indicates improved rates of first year survival compared to 1990-91. Analyses of blood of sea otters caught in oiled areas in 1992, however, showed that approximately 25% of the adult otters have significant elevations in serum enzymes associated with liver and kidney damage. Restoration studies underway in 1993-94 will supply additional information on population size and distribution. The restoration project proposed herein for 1994-1995 will monitor the population to assess whether or not there is evidence of recovery and obtain data to evaluate condition of sea otters and possible pathologies that may be contributing to continued injury in the population.

PROJECT DESCRIPTION

A. Resources and/or Associated Services

This project will monitor sea otters.

B. Objectives

1. Monitor Spring/Summer 1994 abundance and distribution of sea otters in PWS for comparison with previously collected data.

2. Monitor 1994 mortality trends in sea otters such as age class, gender, and location.

3. Investigate pathological conditions of sea otters in PWS. Determine if the pathological conditions observed in 1993 still exist.

C. Methods

1. Abundance and distribution of sea otters in PWS will be monitored through application of aerial surveys developed by USFWS (with partial support of restoration funds) in 1991-1993.

2. Mortality of sea otters will be evaluated by examining the age distribution of beach-cast carcasses retrieved on annual beach walks. Sea otter age will be determined, as in the past, by tooth cementum analysis.

3. Pathological conditions of sea otters will be examined by (1) analysis of hematology and serum chemistry in blood samples collected from live sea otters and (2) gross examination of carcasses and histologic examination of tissue samples collected from carcasses of sea otters taken by subsistence hunters. No alternative methods exist for collection of data.

D. Location

Field work will take place in PWS. Data entry, analysis, and report preparation will take place in Anchorage.

E. Technical Support

None needed.

F. Contracts

Contracts of $0.4 to $0.8K each will be required for determination of age from teeth, for blood analysis, and for necropsies of any intact carcasses that may be recovered.

SCHEDULES

1. Field work - April 15, 1994 to September 15, 1994:

   April/May - Beach walks for carcass retrieval.

   July - Blood collection from live sea otters.

   August - Aerial surveys for abundance and distribution monitoring.

   by September - Collection of carcasses from subsistence takes will depend on hunters but we anticipate obtaining samples by September.

2. Analysis of biological samples (blood, teeth, histopathology) - July to October, 1994.

3. Data entry and analysis - August to November, 1994.

4. Draft reports will be completed by January 16, 1995.

5. Final reports will be completed by March 31, 1995.

EXISTING AGENCY PROGRAM

The USFWS covers salary for two investigators during their contributions to this project (primarily the aerial surveys) - total estimated agency contribution is $14.9K.

The USFWS will be radiotracking juvenile sea otters in PWS on a bi-weekly basis until June 1994, to measure second year survival rates and movements.

ENVIRONMENTAL COMPLIANCE/PERMIT/COORDINATION STATUS

A Marine Mammal Permit is required for handling sea otters and collection of blood; a permit which covers this work has already been issued. Other components of the study involve collection of samples from sea otter carcasses and do not require an additional permit. The aerial survey relies on observations from a small airplane and is non-intrusive. Based on a review of CEQ regulation 40 CFR 1500-1508, this study has been determined to be categorically exempt from the requirements of NEPA, in accordance with 40 CFR 1508.4.

PERFORMANCE MONITORING

Final reports provided by March 31, 1995, will demonstrate that project objectives have been met.

FY94 BUDGET ($K)

AGENCY	USFWS
Personnel	255.0
Travel	11.4
Contractual	88.4
Commodities	19.5
Equipment	0.0
Capital Outlay	0.0
Sub-total	374.3
General Administration	44.4
TOTAL	418.7
NEPA COMPLIANCE	0.0

EXXON VALDEZ OIL SPILL PROJECT DESCRIPTION

Title: Kenai River Sockeye Salmon Restoration

Project Number: 94255

Lead Agency: ADF&G

Cooperating Agencies: None

Project Cost, FY94: $281.1K ADF&G

Project Startup Date: October 1993 **Duration:** 2 Years Remaining of 5

Geographic Area: Upper Cook Inlet, north of a line from Anchor Point to the Red River Delta--Field work will be based out of Soldotna; lab and portions of the data analyses will be conducted in Anchorage.

INTRODUCTION

Sockeye salmon, *Oncorhynchus nerka,* which spawn in the Kenai River system were injured by the *Exxon Valdez* oil spill. Greatly reduced fishing time in Upper Cook Inlet (UCI) due to the spill caused sockeye salmon spawning escapement levels in the Kenai River to exceed that desired by three fold. The biological impact of spill on Kenai River sockeye salmon stocks may be one of the most serious documented. Data collected by Natural Resource Damage Assessment Fish/Shellfish Study #27, *Sockeye Salmon Overescapement*, indicated greatly reduced survival of juvenile sockeye salmon during the winter-spring rearing period beginning with the 1989 parent year. The extremely high escapement may have initially produced more rearing juvenile sockeye salmon than could be supported by nursery lake productivity.

In general, when rearing salmon abundance greatly exceeds lake carrying capacity, the species and size composition of prey resources are altered which affects all trophic levels. Because of such changes, juvenile sockeye growth is reduced, freshwater mortality is increased, greater proportions of fry remain in the lake for another year of rearing, and smolt condition is reduced and marine mortality is increased.

Limiting sockeye salmon fry production by closely regulating the number of spawning adults may be the only way to restore the productivity of these rearing areas. Sockeye smolt outmigrations in the Kenai River were severely reduced in 1991 (1989 parent year) and have continued to decline through 1993. The number of adult sockeye salmon returning from the 1989 overescapement in the Kenai River is expected to be low. Starting in 1994, a dramatic reduction or complete elimination of Kenai River sockeye salmon harvests may be necessary to ensure even minimally adequate escapements.

Sockeye salmon harvested from the mixed-stock fishery of Cook Inlet include fish from the Kenai, Kasilof, and Susitna Rivers. In order to effectively manage the harvest of injured stocks, Restoration Science Studies R53/R59/93012/93015 were implemented in 1992 and 1993. These studies use genetic stock identification (GSI) techniques to identify Kenai River stocks in mixed stock Cook Inlet fisheries. Area managers will use this information to modify fishing areas and openings in order to facilitate the harvest of surplus Kasilof and Susitna River stocks while protecting Kenai River stocks. This project is the continuation of those projects through fiscal year 1994.

Attempts to use stock identification to manage harvests of Cook Inlet sockeye salmon in the past have relied on scale growth patterns. However, the accuracy of the scale technique alone has not been reliable, and it is insufficient to permit the in-season protection of the injured Kenai River stocks. GSI techniques rely on genetic variation to discriminate between populations of organisms. This method has recently been applied in other areas as an in-season fisheries management tool, and it has proven to be extremely effective for allocating and adjusting the harvest of fish stocks intercepted in mixed-stock fisheries such as those that occur in Cook Inlet. Once a data base has been established, GSI techniques should provide a mechanism for in-season management on a stock-specific basis. This will allow managers to control the harvest of Kenai River sockeye salmon and facilitate their recovery.

A pilot study was conducted during 1993, prior to the return of the first impacted stocks anticipated in 1994 (age-5 sockeye salmon from the 1989 parent year). Two fishery samplings were completed using the genetic baseline collected during the 1992 field season. In both cases the laboratory and statistical analysis were completed within 48 hours. Preliminary estimates indicate that this type of information can be sufficiently precise to inform fishery managers on current stock composition in Cook Inlet.

PROJECT DESCRIPTION

A. Resources and/or Associated Services

Restoration of Kenai River sockeye stocks will benefit subsistence, sport, and commercial fishermen in coastal communities throughout Cook Inlet, from Homer north through Anchorage to Tyonek. In 1992 nearly 10,000 families obtained subsistence permits to harvest salmon in UCI, most targeting Kenai River sockeye salmon. The most recent statistics indicate that nearly 100,000 sport anglers fished the Kenai River for salmon in 1990, spending $38 million in 1986 dollars. Forty percent of those anglers were from out of state. Of the 1,323 permits licensed to commercial fish in UCI, 80% are fished by state residents with the remaining predominately from Pacific Coast states. The average exvessel value (1987-1991) of the UCI commercial salmon harvest was $ 67.8 million.

B. Objectives

The goal of this project is to restore Kenai River sockeye salmon injured by the oil spill. This will be accomplished through improved stock assessment capabilities, more accurate regulation of spawning levels, and modification of human use. The specific objectives are to:

1. Use GSI algorithms to estimate the proportion of Kenai River stocks in mixed stock fisheries so that managers may modify area and time of harvest to protect damaged stocks while targeting surplus Kasilof River and Susitna River stocks. Genetic data will be obtained each week from samplings of the mixed-stock fisheries occurring in 1994-1996. Stock composition estimates will be provided within 48 hours post-fishery.

2. Provide accurate estimates of abundance of Kenai River sockeye salmon within Cook Inlet through hydroacoustic assessment techniques.

C. Methods

Stock Identification

Efforts to develop a comprehensive genetic database of sockeye salmon stocks in Cook Inlet will continue. In 1992, baseline genetic data was collected using allozyme analyses from 28 subpopulations from the Kenai, Kasilof, and Susitna Rivers. Beginning in 1993, samples from the UCI commercial harvest were analyzed to estimate the composition of the fisheries. Additional sockeye salmon are being collected from approximately 38 baseline subpopulations in 1993. An additional 10 sites will be chosen each year (1994-1995) to supplement or confirm those previously sampled. This information will enable Area Managers to identify Kenai River fish occurring in the mixed-stock commercial fishery and thus harvest surplus stocks of sockeye salmon while providing protection to injured stocks destined for the Kenai River.

Mixed stock fishery samples will be collected twice weekly from selected drift or set gillnet fishery openings occurring during the July fisheries (1994-1996). Muscle, liver, heart, and eye tissue will be taken from individual fish and examined for discriminating gene markers.

Genotypic and allelic frequency estimates will be calculated from allozyme electrophoretic data for each baseline and mixed-stock sample at every gene locus examined and will be used to identify discrete spawning populations. Stock components of mixed fishery samples will be estimated using a conditional maximum likelihood algorithm. Fishery composition estimates will be available within 48 hours following the fishery so that management decisions can be based on the actual composition of the fisheries.

Representative individuals will be screened for DNA-level markers. Total genomic DNA will be extracted and amplified through polymerase chain reaction techniques using various mitochondrial and nuclear primers. Restriction analyses as well as sequencing studies will be performed. Maximum likelihood simulation studies will be performed to test the additional resolution that could be provided by the DNA-level data. DNA data will be

collected from the fishery samples as scientifically and logistically feasible.

Offshore Test Fish Program

The sockeye salmon total run to UCI has been estimated early during the season by test fishing between Anchor River and Red River delta. Northward migrating sockeye salmon are captured with a drift gill net at a series of stations. Salmon are identified to species and sex, and length measurements are recorded. Estimates of total sockeye salmon return are made several times during the season by estimating expected total test fishery catch per unit of effort for the season and catchability of sockeye salmon in the test fishery. Analysis of historical data indicates that existing sampling effort and catch has not been proportional to abundance. To assess run size more accurately, additional sampling effort will be added to the existing program. In 1992, hydroacoustic equipment and techniques were tested in UCI offshore waters. Results of this work indicated that hydroacoustic techniques could detect salmon and provide a population estimate for "in season" management use. However, the primary limitation identified in the study was vessel speed relative to limitations (signal/noise ratio) of the hydroacoustic gear. Examination of the data set indicated that a minimum of 12 orthogonal transects sampled over 48 hours within Cook Inlet would be needed to provide a useable estimate of adult salmon abundance. In 1993 an increase of vessel speed to 10 km/hr was attempted while completing the 12 randomly selected transects. In addition to this effort the vessel and hydroacoustic gear were deployed for 6 days in conjunction with the existing Alaska Department of Fish and Game (ADF&G) test fish vessel at Anchor Point. The estimates of salmon abundance were compared with the test fish catch for preliminary development of a program to estimate sockeye salmon hydroacoustic targets.

D. Location

Upper Cook Inlet, north of a line from Anchor point to the Red River Delta. Field work will be inlet-wide and based out of Soldotna. Lab work and a portion of the data analyses will be conducted in Anchorage.

E. Technical Support

Administrative support is provided by the Administrative, Habitat and Restoration, and Commercial Fisheries Development and Management Divisions staff of the ADF&G. Project Leaders and their assistants are not fully funded by this project and are supported with general funds from the ADF&G. These studies are integrated with ongoing studies by the Commercial Fisheries Division. Consequently, the spill investigations have been integrated into the normal operations of these Divisions for efficiency in completing the objectives of these studies.

F. Contracts

A sole source contract is proposed (value not to exceed $50.0K) to be awarded to *BioSonics Inc.* for continuing work in UCI with hydroacoustic equipment. *BioSonics Inc.* was awarded the original contract in 1992 and 1993 through competitive bid procedures. The experience gained, and the recent purchase of *BioSonics Inc* equipment for this project, make them the logical contractor for the continuation of these studies.

SCHEDULES

Fishery sample collection	June-July, 1993
Baseline sample collection	Aug-Sept 1993
Laboratory analyses of baseline & fishery samples	July 1993-Apr 1994
Prepare, advertise, and award contract for UCI hydroacoustic survey	Jan-April 1994
Fishery sample collection	June-July 1994
Hydroacoustic assessment	July 1994
Baseline sample collection	Aug-Sept 1994
Laboratory analyses of mixtures; numerical analyses of stock structure; modelling of 1994 fishery samples	May-Sept 1994
Final report from hydroacoustic survey contractor	February 1995
Draft annual report for FY94	March 1995
Final annual report for FY94	June 1995
Baseline analyses, inseason analyses,	Oct 94-Sept 1995
Baseline analyses, inseason analyses, final project report	Oct 95-Sept 1996

EXISTING AGENCY PROGRAM

For FY94 the Division of Commercial Fisheries Management and Development (excluding programs in Sport Fish and Subsistence Divisions of ADF&G) will have the following general fund programs: Area management ($238K), Research to include catch sampling, escapement monitoring, and offshore test fishing ($480K), biometric, technical, and regional

support ($250K), and the statewide genetics laboratory in Anchorage ($500 K).

ENVIRONMENTAL COMPLIANCE/PERMIT/COORDINATION STATUS

The studies proposed provide for data collection and field sampling programs. No environmental effect of these programs occurs beyond that of traditional fisheries management data collection activities. These activities are within existing collecting permits or Federal special use permits issued to the ADF&G for scientific data collection. No other permits or other coordination activities are involved.

The National Oceanic and Atmospheric Administration (NOAA) is lead Federal agency for National Environmental Policy Act (NEPA) compliance for this project. This project meets NOAA agency requirements for Categorical Exclusion from the NEPA process.

PERFORMANCE MONITORING

Administrative aspects (personnel, expenditures, etc.) follow the Alaska Department of Fish and Game's Standard Operating Procedures Manual. The scientific and technical aspects of the study are subject to internal review within the Commercial Fisheries Management and Development Division and the Habitat and Restoration Division, Restoration Section. Publications are submitted through an internal peer review process with the major findings submitted to peer review journals. Reports, work plans, and study design are subject to the peer review process established by the Trustee Council and the Chief Scientist. This year, technical aspects of the overescapement studies' findings to date, and future plans were reviewed by a panel of international sockeye salmon researchers in a special session of the Kokanee and Sockeye Salmon workshop sponsored by the Northern Pacific International Chapter of the American Fisheries Society at Vancouver, B.C. in March, 1992. These studies provide the basis for the management programs being developed under this restoration project. Annual final reports will be generated with publications being provided in peer review journals and scientific symposia, as significant findings are obtained. The final project report will be issued upon completion of the final year of field data collection.

FY94 BUDGET ($K)

AGENCY	ADF&G
Personnel	208.0
Travel	9.1
Contractual	90.1
Commodities	37.4
Equipment	24.0
Capital Outlay	0.0
Sub-total	368.6
General Administration	37.5
TOTAL	406.1
NEPA COMPLIANCE	0.0

EXXON VALDEZ OIL SPILL PROJECT DESCRIPTION

Title: Sockeye Salmon Overescapement

Project Number: 94258

Lead Agency: ADF&G

Cooperating Agency: None

Project Cost, FY94: $475.7K ADF&G

Project Startup Date: October 1, 1993 **Duration:** 3 years

Geographic Area: Upper Cook Inlet and Kodiak Island

INTRODUCTION

This study is a continuation of the oil spill damage assessment program initiated in 1990 with modifications based on FY93 study results. Recommendations provided by an international review team of sockeye salmon experts have been incorporated.

In 1989, commercial fishing for sockeye salmon was curtailed in Upper Cook Inlet (UCI), the outer Chignik districts, and the Kodiak areas due to presence of oil in the fishing areas from the *Exxon Valdez* oil spill. As a result, the number of sockeye salmon entering four important sockeye producing systems (Kenai/Skilak, Chignik/Black, Red, and Frazer Lakes) and two less important lake systems (Akalura and Afognak or Litnik Lakes) greatly exceeded levels that are thought to be most productive. Sockeye salmon spawn in lake-associated river systems.

Overly-large spawning escapements may result in poor returns by producing more rearing juvenile sockeye than can be supported by the nursery lake's productivity. This project continues examining the effects of large 1989 spawning escapements on the resulting progeny and associated foraging habitat for a select subset of the above mentioned sockeye nursery lakes. Three impacted lake systems where the 1989 escapements were more than twice the desired levels (Kenai/Skilak in UCI; Red and Akalura Lakes on Kodiak Island) were selected. Upper Station Lake, which is near the two impacted lakes on Kodiak, did not receive a large escapement and has been examined as a control. Because of significant differences in the basin morphology and limnology, Upper Station has proved relatively ineffective as a control. Beginning in 1994, Frazer Lake will be used for future comparisons. Because this lake has undergone detailed study in the past and has continued funding for other sources, minimal funding is necessary to provide for data collection to insure comparisons with Akalura and Red Lakes. Similarly, Tustumena Lake on the Kenai Peninsula received normal escapements and is used as a control for the Kenai River system lakes.

In addition, the study proposal reflects results of data collected in the spring of 1993. Continued poor smolt production from the Kenai River is suggested, despite normal smolt production from Tustumena Lake, the control for this system. The 1992 and 1993 preliminary data indicate Red Lake zooplankton communities and nutrient levels have recovered to the level measured in 1986, prior to the spill. Smolt numbers appear to be lagging but adult forecasts for returns in 1994 suggest Red Lake escapement goals will be met. Therefore, management actions will be used as the primary method for restoration. Smolt numbers will be used to forecast future returns to provide assistance in future harvest management decisions. Akalura Lake demonstrated poor zooplankton densities and low smolt numbers. A restoration plan for Akalura Lake will be produced during the winter of 1993-94 based on analysis of data collected to date.

The 1993 smolting information from the Kenai system lakes indicates poor smolt production. In addition, the Russian River smolt project indicated very poor production, suggesting this system may also be below production expectations. This system was first identified as having suspect production when the 1992 smolt count from the lower Kenai failed to produce sufficient numbers of age 2 smolt to account for historic Russian River smolt migrations. This project suggests further investigations into the Russian River are warranted Research on the Chignik ecosystem is conducted by the Fisheries Research Institute (FRI) of the University of Washington and the Alaska Department of Fish and Game using General Fund monies. The scope of this research is sufficient to monitor ecosystem disturbances and spill funding is not being requested for Chignik research.

PROJECT DESCRIPTION

A. Resources and/or Associated Services

Sockeye salmon stocks on Kodiak Island and the Kenai Peninsula are being examined. These stocks support commercial and sport fisheries worth several hundred million dollars annually. These studies will monitor the extent of the damage to these stocks and attempt to establish the mechanism that led to stock collapse. These studies follow the pattern established in the original 1990 study plan with modifications to accommodate recent findings.

B. Objectives

The following objectives have been altered based on input from peer reviewers of the 1992 progress report and proposed revisions to the 1994 study program:

1. Estimate critical biological attributes (number, age, size) of both resident and migrant juvenile sockeye in overescaped and normal escaped sockeye salmon nursery lakes of the Kenai Peninsula and Kodiak Island.

2. Determine effects on smolt production and subsequent adult returns caused by large escapements resulting from fishery closures after the spill. These effects will be inferred by studying the changes in the rearing

capacity of selected nursery lakes which were either affected or unaffected by the spill. Data used for these inferences include:

a. age and growth of juveniles and smolts
b. nursery area nutrient budgets and plankton populations
c. seasonal, diel, and vertical distribution of zooplankton species which are the known prey of sockeye salmon in Skilak, Kenai, and Tustumena Lake
d. seasonally available zooplankton biomass in these lakes and the relationship of this biomass to ambient temperature and light.

3. Develop a pilot research project to determine the cause of the decline and potential restorative actions.

C. Methods

For each of the lake systems identified, the response (abundance, growth, and freshwater age) of rearing juveniles will be studied. Because of the significance and magnitude of the findings on Red Lake, and on Skilak/Kenai Lakes, these studies will continue until observed effects on growth and the limnetic community of the lake ecosystems recovers to pre-spill conditions.

The timeline of the 1993 studies is outlined on Figure 1. This table depicts the sampling schedule for the integrated limnological studies and fisheries studies on the Kenai Peninsula. The total number of juvenile sockeye in the Kenai Peninsula lakes will be estimated through hydroacoustic surveys conducted during all years up until recovery of the system is observed. Age and size information will be obtained from samples of juvenile sockeye collected from concurrent mid-water trawl netting surveys. Survey transect designs for hydroacoustic sampling and tow netting have been established for Kenai and Skilak lakes and Tustumena Lake. Depending on densities of rearing juvenile sockeye salmon, estimates of fish densities will be made for each transect either by echo integration or by echo counting. Total fish population estimates will be computed by summing transect populations along with 95% confidence intervals. Additional studies of the vertical distribution of Skilak Lake sockeye will be conducted simultaneously with population estimates. An additional sampling period--for vertical sampling only--is scheduled for November, 1993.

Freshwater growth and age of sockeye salmon rearing juveniles from all study systems will be determined from scale and possibly otolith measurements made either by direct visual analysis of scales or using an Optical Pattern Recognition system. In cases where data are available (e.g., Kenai and Skilak Lakes and Tustumena Lake), growth of progeny from the 1989 spawning escapements will be compared with growth or size of progeny during prior years.

The total number of smolt migrating from each system will be estimated with a mark-recapture study using inclined plane traps. Smolt will be captured in traps, sampled for age

and size information, marked with Bismark Brown Y (a biological dye), and transported upstream of the traps and released for subsequent recapture. Periodic retesting will determine the capture efficiency of the traps under changing river conditions during the spring. Total population estimates (with 95% confidence intervals) will be made using catch efficiencies. Smolt size and age information will be calculated weekly. Smolt programs consistent with those for the study lakes are continuing for Tustumena Lake.

On the Kenai River, the smolt operation will require expansion to include the Russian River. This lake system apparently now is the dominant producer of sockeye salmon smolt and is upriver from the current smolt project on the mainstem Kenai River. To determine the production of smolt from the Kenai River mainstem, estimates of smolt production from the Russian River lake system must be completed to separate normal Russian River production from the smolt production of sockeye salmon rearing in Skilak and Kenai Lakes. These methods are being established to insure that current projections of smolt production from the Kenai River lake systems are not an artifact of some unknown sampling bias.

The current length frequency data on sockeye smolts at the mainstem Kenai River smolt traps indicates that we may be missing a portion of the Russian River smolt outmigration. With the excellent genetic separation of Russian River sockeye from mainstem Kenai fish, separation of these two components in the catch should be possible. This will allow for a better total smolt estimate and verification of the Russian River smolt trap data.

The smolt data for 1993 indicates that the Russian River lake systems may be experiencing declines in production similar to the mainstem Kenai River. Therefore, to evaluate the current production potential and impacts of large escapements, limnological and fry hydroacoustic/tow net surveys of the Russian lakes are proposed. Techniques duplicate those used on other systems.

In the two Kenai Peninsula lakes, late fall sampling of fry will be conducted. Based on peer review comments, hydroacoustic studies of fry abundance will be conducted into the fall 1993 period, to track and sample the juvenile fish until cold weather prevents further studies. This is based on the assumption that most of the density dependent mortality occurs in early winter.

Studies on Kodiak Island will be reduced because of recent findings which indicate recovery is occurring. These include elimination of the smolt weir counts on Red River; relying instead on mark/recapture studies with smolt traps to estimate smolt abundance in 1993. In 1992, the hydroacoustic surveys were eliminated on these lakes because of interference of sticklebacks with the population estimates. Samples of fall fry for age, weight, and length will continue to be collected. The variation and differences in Upper Station Lakes suggest this system is inadequate as a control for Red Lake and Akalura Lake. Therefore, Frazer Lake will be used as a control in the future. Monitoring of this system is primarily conducted using general fund expenditures of the ADF&G. A minor modification will be made to the program to insure compatibility with the monitoring continuing on Akalura and Red lakes. Funding from these studies will be used to augment the regular smolt monitoring program. A second inclined plane trap will be used to ensure that adequate samples are obtained to accurately describe smolt population numbers and age, weight, and length characteristics.

This will insure precision levels similar to the Red and Akalura lakes studies. The continued poor smolt production in the spring of 1993 (preliminary data - 400,000 Red Lake, 70,000 Akalura) suggest continued monitoring of these systems is warranted.

Limnological data will be collected to monitor the response of the lakes to high juvenile rearing densities and their recovery once escapement levels decline. Figure 1 provides a timeline of these studies and reflects the integration with the fisheries investigations previously discussed. These data will be used to estimate carrying capacity parameters of euphotic volume, nutrient budgets (carcass enrichment), and zooplankton biomass, body-sizes, and composition shifts. Approximately six limnology surveys will be conducted at two stations, to determine zooplankton species abundance and body-sizes, nutrient chemistry, and phytoplankton abundance for Kenai/Skilak, Tustumena, Red, and Upper Station Lakes.

In cases where seasonal data are available (i.e., Kenai, and Skilak Lakes), limnological parameters taken during residence of the juveniles from the 1989 spawning escapements will be compared to parameters within these systems during prior years.

Although Kenai River system smolt enumerations and fall fry estimates during 1991, 1992 and the spring of 1993 produced very low numbers, zooplankton biomass estimates in Skilak Lake, the major sockeye salmon producer, have not undergone similar levels of decline. To further understand the mechanism that may regulate the survival of sockeye salmon juveniles in this lake, early spring tow netting for juvenile salmon was conducted. Failure to collect significant numbers prompted limited distribution studies of juvenile sockeye in the lakes. These data indicated concentrations during the day near 40m but in very low abundances. These findings prompted limited vertical sampling of the zooplankton community to determine depth distribution. During the day, most of the zooplankton biomass was concentrated at the same depth as the fish with increased surface concentrations during the night. Since light extinction during the spring occurred at a depth of 15m and the lake was isothermal at 2.5°C, this distribution pattern seemed peculiar. Since sockeye salmon are principally sight feeders, this indicated that much of the biomass was unavailable for feeding. The control lake, Tustumena, indicated that the same species of zooplankton did not exhibit a similar vertical distribution. One possible mechanism that would explain the difference is food satiation. Due to heavy cropping of the zooplankton community in Kenai and Skilak Lakes, the zooplankton may respond by no longer competing for limited food resources and are able to find sufficient food while spending relatively short amounts of time at the depths where they are susceptible to sight feeding predators (sockeye salmon). Thus, although the high turbidity and cold temperatures of Tustumena produce more limited biomass of zooplankton, their continual presence in the surface light layer makes them much more vulnerable to feeding sockeye than in Kenai and Skilak Lakes. The relationship between the higher cropping rate on the egg-bearing component of the zooplankton population and the loss of needed lipids for overwintering survival of juvenile sockeye salmon is also being examined.

To further the understanding of the mechanism causing sockeye salmon decline, much more intensive sampling of the diel and seasonal distribution of plankton in the glacial lakes

of the Kenai Peninsula was initiated in the summer of 1993 by use of a towable optical zooplankton counter (OPC). Ongoing studies will determine if this device will meet expectations. This program will be continued in 1994 if successful. These data will be coupled with sampling of rearing sockeye salmon fry in the lakes by means of trawl net developed by Biosonics, Inc., capable of sampling differential depths. The collected fish will be sampled for age, weight, and length, lipid content, and stomach contents.

In Skilak Lake and Tustumena Lake during each of these four sampling periods, zooplankton and sockeye salmon diel migration will be estimated at one location. This will involve continuous sampling with the OPC over various depths and a concurrent hydroacoustic survey for one 24 hour cycle.

The above data will be integrated with the other information to develop a seasonal model of food availability within the euphotic zone of the lake to predict fish biomass production from these systems. The studies will begin in early 1993 and continue for a minimum of one calendar year.

The holistic approach proposed here involves several evaluation procedures to assess the effects of sockeye salmon overescapement. First, fresh-water production from the 1989 escapements will be assessed in Kenai/Skilak, Red, and Upper Station Lakes. This will be accomplished through analysis of growth, freshwater survival (in particular, overwinter survival), and freshwater age of sockeye smolt populations. Any anomalies will be determined by analysis of freshwater growth recorded on archived scales, historical freshwater age composition, and modelled freshwater survivals; and from results of previous studies as well as the 1991 smolt characteristics from each of the study systems. Also, planktonic food sources will be assessed through estimation of zooplankton prey biomass and diversity of species. Some of these analyses have been completed.

Second, future sockeye salmon production from the 1989 parent year and subsequent parent years will be estimated based on spawner/recruit relationships. Losses of adult sockeye production from subsequent parent years may result from negative effects caused by progeny of the 1989 escapement on the lake's carrying capacity. The spawner/recruit relationships will be estimated from historical stock specific return data (where available), and generalized spawner/recruit data scaled to the carrying capacity parameters (i.e., euphotic volume and zooplankton biomass) of the nursery lakes where stock specific return data are not available. If it is determined that in any of the affected systems, the density dependent effects are occurring outside of the traditional models, the effects will be isolated by examining a broader time window of the rearing life history of these species.

Third, experimental and empirical sockeye life history/production models will be used to compare salmon production by life-stage at escapement levels consistent with management goals to the 1989 escapements. These models will be refined by use of food availability data obtained through the vertical sampling studies initiated in 1992. Additionally, in the case of the Kenai system, the 1989 escapement effects will be viewed independently of the effects on previous brood years with high escapement.

D. Location

Study locations are on Kodiak Island and the Kenai Peninsula.

E. Technical Support

Administrative support is provided by the Divisions of Administrative , Habitat and Restoration (H&R), and Commercial Fisheries Management and Development (CFMD) staff of the ADF&G. Project Leaders and their assistants are not funded by this project. They are supported with general funds from the State of Alaska. Most laboratory analyses are conducted by the CFMD Limnology laboratory in Soldotna. These studies are integrated with ongoing studies by the CFMD on Kodiak Island and the Kenai Peninsula. These studies have different objectives (i.e., to manage, enhance, and rehabilitate common property salmon fisheries), but use the same techniques and data collection methods. Consequently the spill investigations have been integrated into the normal operations of these divisions for efficiency in completing the objectives of these studies and the general mission of these agencies.

F. Contracts

Technical support for specialized analyses are conducted by reciprocal service agreements with the University of Alaska at Palmer (lipid analysis) and Fairbanks (Nitrogen 15 analysis). These contracts were issued in 1992 and 1993 to provide specialized analysis not routinely used by the CFMD Limnology laboratory.

EXISTING AGENCY PROGRAM

The ADF&G has ongoing commercial fisheries research operations on the Kenai and Kasilof River, Frazer Lake, Red River, Akalura Lake, Upper Station Lake, and Afognak Lake. The ADF&G and FRI research currently being conducted at Chignik Lake is sufficient and does not require additional Trustee Council funding. In addition, there are ongoing data collection activities from Hidden, Karluk, and Spiridon lakes relating to the limnology of these systems.

The following is a synopsis of projects funded by the State of Alaska General Fund (in $K):

Kodiak Island		
Kodiak Bio Rehabilitation		174.1
Spiridon Lake Assessment-		42.8
Frazer Lake /smolt operation		36.6
Kodiak Finfish research		154.4
Kodiak Frazer/Upper Station		
In-season forecasting		31.5
Kodiak Major System Weirs-		168.2
Total		607.6
Kenai Peninsula		
Statewide Limnology Staff (Part)	160.0	
Limnology & Estuarine Studies		100.0
Cook Inlet Aquaculture Association		
Contracts (Hidden Lake-Others)		18.0
Kenai River Sonar		45.4
Kasilof River Sonar		28.7
Soldotna Research Staff		203.1
Stock Identification,		
Upper Cook Inlet		56.9
Total		612.1
Grand Total		1,219.7

ENVIRONMENTAL COMPLIANCE/PERMIT/COORDINATION STATUS

The field activities of this project are authorized under existing state scientific collecting permits and federal special-use permits for scientific data collection. New programs on the National Wildlife Refuge are updated through permit amendments as needed. No other permits or other coordination activities are involved.

The National Oceanic and Atmospheric Administration (NOAA) is lead Federal agency for National Environmental Policy Act (NEPA) compliance for the project. This project meets NOAA agency requirements for Categorical Exclusion from the NEPA process.

PERFORMANCE MONITORING

Administrative aspects (personnel, expenditures, etc.) follow the Alaska Department of Fish and Game's Standard Operating Procedures Manual. This project is one of over 15 currently maintained by the CFMD Division Limnology Section and is administered accordingly. Quality control of the laboratory is conducted routinely, and follows methods outlined in the laboratory manual referenced in this report. The laboratory is rated annually

by the U.S. Geological Survey, by conducting tests on blind samples provided by this group. Replicates are routinely run to cross-check analytical techniques.

This year, technical aspects of the studies findings to date and future plans were reviewed by a panel of international sockeye salmon researchers in a special session of the Kokanee and Sockeye Salmon workshop sponsored by the Northern Pacific International Chapter of the American Fisheries Society at Vancouver, B.C. in March, 1992. Annual reports will be prepared. The final project report will be issued following completion of the last year of field data collection.

FY94 BUDGET ($K)

AGENCY	ADF&G
Personnel	602.8
Travel	13.5
Contractual	71.2
Commodities	49.5
Equipment	22.5
Capital Outlay	0.0
Sub-total	759.5
General Administration	95.4
TOTAL	854.9
NEPA COMPLIANCE	0.0

EXXON VALDEZ OIL SPILL PROJECT DESCRIPTION

Title: Coghill Lake Sockeye Salmon Restoration

Project Number: 94259

Lead Agency: ADF&G

Cooperating Agency: USFS

Cost of Project, FY94: $113.2K ADF&G

Project Startup Date: October 1993 **Duration:** 5 years

Geographic Area: Prince William Sound

INTRODUCTION

This project aims to restore the natural productivity of Coghill Lake and the resident sockeye salmon (*Oncorhynchus nerka*) population through lake fertilization. The Coghill Lake sockeye salmon stock historically supported important sport and commercial fisheries. Sockeye salmon returns to Coghill Lake have declined in recent years from a historical average of 250,000. In 1993, only 9,000 sockeye entered Coghill Lake to spawn. It is possible that juvenile salmon were affected by the *Exxon Valdez* oil spill which may have contributed to the decline of the Coghill sockeye stock. Salmon migration patterns indicate that juvenile sockeye smolt from Coghill Lake likely migrated through oil-contaminated areas in western Prince William Sound (PWS). Juvenile salmon similar in size to Coghill smolts used oiled nearshore nursery habitats. The growth and survival of juvenile salmon using these habitats was reduced by oil contamination from the spill. The Coghill Lake stock is presently at dangerously low levels. Action must be taken to restore the stock before any further decline occurs. Lake fertilization techniques have been successfully applied in Alaska and elsewhere to restore the productivity of sockeye salmon rearing lakes. The production of sockeye salmon populations is closely linked to the productivity of lakes where the fish rear for 1 to 3 years. The availability of food in rearing lakes determines the growth and size of smolts that emigrate to sea. Smolt size in turn determines 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. Fertilization is needed to increase lake productivity and boost fry food abundance. As the natural productivity of the lake is restored, the sockeye salmon spawning population will be allowed to gradually increase. This approach will prevent overgrazing of restored zooplankton stocks and allow a gradual transition from fertilization by man to natural input of nutrients from salmon carcasses.

PROJECT DESCRIPTION

A. Resources and/or Associated Services

This project will restore an important natural resource and resource service in the spill-affected area. Restoration of the Coghill sockeye stock will further provide natural resource services to replace those once provided by other injured stocks. The communities of Anchorage, Whittier, Valdez, and Cordova will benefit from this project. Coghill Lake sockeye have been heavily used by sport fishermen travelling from Whittier by boat and from Anchorage by air. Commercial fishermen from all of these communities have historically fished the Coghill Lake sockeye salmon stock. Restoration of Coghill Lake sockeye salmon will further improve management of important sockeye and chum salmon stocks returning to hatcheries in western PWS.

B. Objectives

The goal of this project is to restore the natural productivity of Coghill Lake and the resident sockeye salmon population through use of established lake fertilization techniques. The U.S. Forest Service (USFS) will apply fertilizer to the lake each summer for 5 years. The Alaska Department of Fish and Game (ADF&G) will conduct limnological and fisheries studies needed to monitor and refine the fertilization program. These studies will focus on the effects of fertilization on primary and secondary production and the growth and survival of juvenile sockeye salmon in the lake. The ADF&G component of the project will achieve the following objectives each year:

1. Apply fertilizer to Coghill Lake and elevate the productivity of the lake ecosystem.

2. Monitor the residence time of nutrient-enriched water in the lake.

3. Determine the effect of fertilization on primary and secondary production.

4. Determine the effect of fertilization on the food consumption, growth, and condition of sockeye salmon fry.

5. Determine the effect of fertilization on the overwinter survival, age, size, and condition of smolts emigrating from the lake.

C. Methods

Lake fertilization is recommended for 1 salmon life cycle (5 years) to elevate the productivity of the lake and the resident salmon population. Approximately 273 mg m^2 of phosphorus will be added to the lake each year. An additional 2,273 mg m^2 of nitrogen will be added each year to maintain an 18:1 ratio of nitrogen to phosphorus. A pharmaceutical-grade liquid fertilizer will be applied from a low-flying aircraft. Application will consist of 6 to 9

passes of 5-minute duration 1 day each week. Fertilizer will be applied from the end to June to early September.

The effect of lake fertilization on primary and secondary production will be assessed by comparing limnological data collected before and after fertilization. Five years of limnological data collected monthly at Coghill Lake is available for the comparison. Limnological sampling will be conducted twice each month at 3 stations. Dissolved oxygen concentrations will be measured from the surface to a depth of 60 m. Eight one-liter water samples will be collected from the 1 meter stratum, chemocline, and monimolimnion. Water samples will be analyzed for the following parameters: conductivity, alkalinity, calcium, magnesium, turbidity, total iron, filterable reactive phosphorus, total phosphorus, nitrate and nitrite, total Kjeldahl nitrogen, total nitrogen, and reactive silicon. Zooplankton samples will be collected at 11 stations twice each month. Zooplankton abundance and species composition will be estimated from replicate counts of organisms in 1 ml subsamples. Zooplankton dry weight and biomass will be estimated by regression analysis using body length measurements on 30 individuals from each taxa. Light penetration will be measured at 1 meter increments from the surface to a depth equivalent to 1% of the surface light level. Euphotic zone depth will be estimated from light measurements. Water temperature in the epilimnion and water level will be continuously monitored by electronic recorders moored at 1, 10, 20, and 30 meter depths.

The habitats used by sockeye salmon fry in the lake will be determined from visual surveys, beach seine and tow net catches, and hydroacoustic surveys conducted in July, August, September, and October. A 120-kHz dual-beam echosounder will be used to determine the distribution and abundance of juvenile sockeye salmon each month. Ten samples of 10 juvenile sockeye salmon will be collected from various habitats during each survey for later analysis of stomach contents and growth.

The effect of the fertilization program on food consumption will be assessed by testing for changes in prey composition and feeding rate over time as the fertilization proceeds. Stomach analysis will be conducted on juvenile sockeye (n=100) collected during each survey. Prey items in the stomach will be identified to the lowest possible taxonomic level. Prey body weight will be estimated by regression analysis using body length measurements on at least 30 individuals from each taxa. Total stomach contents weight will be estimated by the product of abundance and mean body weight for each taxa. Analysis of variance on the ranks will be used to test for differences (P=.05) in the proportion of stomach contents weight in each taxonomic group between months and years. Analysis of covariance will be used to test for differences (P=.05) in total stomach contents weight between months and years.

The effect of the fertilization program on fry growth will be evaluated by testing for changes in temperature-specific growth between years. Juvenile sockeye salmon growth will be estimated from body weight measurements and estimated age from time of outmigration into the lake. Otolith microstructure analysis will be used to estimate age from time of outmigration. Otolith increment count and radius length will be measured on each otolith

(n=100) collected during monthly surveys. An exponential growth model will be used to estimate fish growth. Analysis of covariance will be used to test for differences (P=.05) in temperature-specific growth between years.

The effect of the fertilization program on survival of juvenile sockeye salmon will be evaluated by testing for pre- and post-fertilization differences in overwinter survival, fall fry condition, and size-at-age. Overwinter survival of juvenile sockeye will be estimated from fall fry and spring smolt population estimates. Fall fry population size will be estimated with a 120 kHz echosounder towed along 10 randomly selected transects. A mid-water trawl will be used in conjunction with the hydroacoustic surveys to determine species composition, age, and size of fish targets. Sockeye salmon smolts emigrating from the lake will be enumerated using inclined-plane traps. The traps will be operated continuously from early May through June. The catch efficiency of the traps will be determined by mark-recapture analysis. Age composition and size will be estimated from smolt samples (n=40) collected each day. Analyses of variance and covariance will be used to test for pre- and post-fertilization differences (P=.05) in age composition and smolt condition, respectively.

D. Location

This project will be conducted at Coghill Lake which is located on the eastern side of Port Wells in the northwest region of PWS.

E. Technical Support

Data archiving services will be required to adequately document and maintain data obtained from this project.

F. Contracts

A private company will be contracted to apply fertilizer to the lake. The agencies involved in this project do not have the equipment or expertise required to complete this phase of the project.

SCHEDULES

This project will be conducted over a 5-year period which corresponds to the generation time for Coghill Lake sockeye salmon. Lake fertilization is expected to elevate lake productivity until carcasses from adult spawners can once again contribute significantly to the nutrient load in the lake. Project activities will take place throughout each year (Table 1).

Table 1: Annual schedule of project activities (1994-1997).

May - June	Enumerate outmigrant smolts and estimate smolt age and size
June - October	Apply fertilizer each week and conduct limnological sampling
June, Aug., Oct.	Determine fish habitat use and sample for otolith and stomach analysis
October	Estimate fall fry population size using hydroacoustic techniques
June - October	Conduct laboratory analyses of limnological, otolith, and stomach samples
October-Dec.	Analyze data and prepare annual report

EXISTING AGENCY PROGRAM

The ADF&G operates a weir on Coghill River for enumerating adult salmon returning to spawn. The annual operating cost of the weir project is $18.5K.

ENVIRONMENTAL COMPLIANCE/PERMIT/COORDINATION STATUS

The USFS is lead Federal agency for National Environmental Policy Act (NEPA) compliance for this project. The USFS has conducted an Environmental Assessment to evaluate the various options for rehabilitating Coghill Lake and the resident sockeye salmon population. The assessment has found no significant effects and no EIS was required.

PERFORMANCE MONITORING

A project report will be submitted by February 1, 1995 detailing the results of the FY 1994 season.

FY94 BUDGET ($K)

AGENCY	ADF&G	USFS	OAL
Personnel			0.0
Travel			0.0
Contractual			0.0
Commodities			0.0
Equipment			0.0
Capital Outlay			0.0
Sub-total	0.0	0.0	0.0
General Administration			0
TOTAL	0	0	0

NEPA COMPLIANCE

EXXON VALDEZ OIL SPILL PROJECT DESCRIPTION

Title: Shoreline Assessment and Oil Removal

Project Number: 94266

Lead Agency: ADEC

Cooperating Agencies: NOAA

Cost of Project, FY94: $341.6K ADEC

Project Startup Date: February 1, 1994 **Duration:** 1 year

Geographic Area: Prince William Sound

INTRODUCTION

Shorelines treated during spill response activities need to be monitored to ensure recovery is proceeding at an acceptable rate and surveyed for emerging subsurface oil brought to the surface as a result of winter storms.

Shorelines treated in 1992 and earlier and other oiled sites need to be evaluated to determine the response to previous treatment, or if additional activities are required to restore resources and services. State and federal technical experts with *Exxon Valdez* spill experience will evaluate shorelines for the presence of *Exxon Valdez* hydrocarbons. The goal of the evaluation will be to document the amount of remaining hydrocarbons and determine the effect of the remaining oil on shoreline activities. Residents of the area continue to express uncertainty about the health of subsistence resources, and that uncertainty has led to changes in traditional subsistence patterns. Recreational users have expressed continuing concern about the visual impact of surface oil on the quality of the recreational experience. In addition, recreational users have placed a high priority on removing rebar, flagging, signs, back-stakes, and other shoreline debris left on shorelines by clean-up and damage assessment crews.

PROJECT DESCRIPTION

A. Resources and/or Associated Services

This project will examine shorelines and determine if resources and services are still impacted by *Exxon Valdez* oil and assess the need for additional treatment. The public, landowners and resource managers need to have current and accurate field information for operation and management. If resources are impacted and need to be restored, technical experts need to survey the sites and determine the best course of action to correct the

problem to ameliorate further injury. Public complaints about the presence of hydrocarbons can be investigated, the questioned area assessed and the criticism addressed through the framework of this project. Information collected by this project will assist Trustee Council review of other projects submitted for funding by providing current, accurate information about shoreline conditions. Accurate field information will be used by Restoration Team members to identify areas with persistent hydrocarbon concentrations that may affect other restoration activities.

B. Objectives

The overall purpose of the project is to determine the status of shoreline recovery and if additional restoration activities are required. The project objectives are to assess the shoreline hydrocarbon concentrations and, where appropriate, to carry out necessary treatment either during the survey or following the survey using local work crews to perform the identified work. The shoreline assessment will use the process developed and refined since the 1989 spill:

1. Survey shorelines for the presence of *Exxon Valdez* hydrocarbons and/or clean up detritus
2. Determine if resource uses are affected by hydrocarbons
3. Locate and remove debris left by clean-up and/or study teams.
4. Perform light duty manual treatment to restore resource use if necessary and feasible
5. Write work orders for local crews to treat the shoreline if necessary.
6. Document field activities.

C. Methods

The Alaska Department of Environmental Conservation, in conjunction with the other Trustee Agencies and in consultation with the U.S. Coast Guard, will review the 1993 shoreline survey information and produce a list of subdivisions to be surveyed in 1994. The list will then be released for public review and comment.

In the field, agency technical experts and the upland landowners will assess the shoreline segments and document oiling conditions. The survey team will be berthed on a vessel and use skiffs to access the shoreline. Float planes will provide logistics support. Previous *Exxon Valdez* assessment surveys have used these logistics as the most cost effective and time efficient support structure. Agency representatives will be chosen for their environmental and habitat experience. Each person will have extensive *Exxon Valdez* spill experience. Surveys will be conducted daily during both low tide windows unless adverse weather conditions develop.

Field information will be recorded on forms standardized during previous surveys to facilitate comparison and compatibility with the existing databases.

The next phase is the restoration of resources and services, if necessary. Agency personnel (with input from the upland landowner) will determine if treatment is necessary based on established state and federal standards. Such a determination would include consideration of the resources impacted by the oil, the area and concentration of remaining oil, the cost effectiveness and technical feasibility of restoration, the services (such as subsistence) provided by the shoreline segment, and a reasonable expectation that the treatment or oil removal will not cause more injury than allowing the oil to remain in place. Such a determination would be made by the Trustee agencies in consultation with the Chief Scientist.

Any light duty restoration work that is determined to be necessary would be completed during and after the survey by the survey crew (which has proven to be the most cost effective method of treatment). Any restoration activities done in oiled mussel beds will be conducted in conjunction with Project # 94090 to ensure appropriate treatment methods are used and to monitor the effectiveness of treatment.

The need for shoreline treatment work in 1994 cannot be determined until the 1993 shoreline assessment is completed and the results of several damage assessment and restoration studies become available this winter and next spring. Because of the necessity of preplanning logistics support, we will assume limited restoration activities will be necessary. If restoration activities are found to be unnecessary, logistics support will not be used, and the money will be returned to the Trustee Council for use in other restoration activities. If additional work is found to be necessary at a level greater than initially authorized, additional funds will be requested from the Trustee Council to expand the effort.

D. Location

This project will assess *Exxon Valdez* impacted shorelines in Prince William Sound and the Gulf of Alaska. The principal areas are Knight, Latouche, Evans, Elrington, Green, and Disk Islands in Prince William Sound and Tonsina Bay, Windy Bay and Chugach Bay in the Gulf of Alaska. These areas are in proximity to Chenega Village, Whittier, Port Graham, Seward and Homer.

E. Technical Support

The project will require data processing support to update existing files detailing the conditions of the specific beach segments surveyed. Detailed data related to the amount of oiled gravel removed from each beach will also be entered into the data base.

F. Contracts

Local communities for labor
Aircraft for logistics
Vessel for transportation and housing
Vessel to remove collected oil from cleanup areas
Rehabilitation of contaminated gravel

SCHEDULES

February 1994	Coordination and planning with participating agencies
March 1994	Negotiate contracts with communities for crews
April - May 1994	Procure supplies
	Obtain Haz-Mat training
June - August 1994	Staff and crews in field
	1. surveys
	2. oil dispersal
September 1994	Record updating and data entry
October - November 1994	Report to Trustees

EXISTING AGENCY PROGRAM

None

ENVIRONMENTAL COMPLIANCE/PERMIT/COORDINATION STATUS

As in prior years, permits and notifications will be required by several permitting agencies. All permits will be obtained prior to commencement of field work.

PERFORMANCE MONITORING

A list of segments which will be assessed during the project will be prepared and distributed prior to shoreline assessment. A report detailing restoration actions at each shoreline segment will be produced following completion of the field work.

FY94 BUDGET ($K)

AGENCY	ADEC	OAA	OAL
Personnel			0.0
Travel			0.0
Contractual			0.0
Commodities			0.0
Equipment			0.0
Capital Outlay			0.0
Sub-total	0.0	0.0	0.0
General Administration			0
TOTAL	0	0	0

NEPA COMPLIANCE

EXXON VALDEZ OIL SPILL PROJECT DESCRIPTION

Title: Chenega Chinook Release Program

Project Number: 94272

Lead Agency: ADF&G

Cooperating Agency: None

Cost of Project, FY94: $57.4K ADF&G

Project Startup Date: October 1993 **Duration:** 4 years

Geographic Area: Crab Bay near Chenega Bay Village in Prince William Sound

INTRODUCTION

In 1992, the Alaska Department of Fish and Game (ADF&G), in cooperation with the residents of the village of Chenega Bay, proposed to the Exxon Valdez Trustee Council that local salmon runs be established at Crab Bay, near the village. The purpose of the release is to develop an alternative food source for people whose subsistence resource was damaged by the oil spill. The original proposal called for the first release to occur in 1993, but timing requirements for planning and permitting caused the proposed release to be delayed until 1994.

PROJECT DESCRIPTION

A. Resources and/or Associated Services

The residents of Chenega and local commercial and sports fishermen will be the principal beneficiaries of this project because of their proximity to the proposed release site.

B. Objectives

The objective of the release program is to develop a return of 2,000 adult chinook beginning in 1998 with fewer numbers of younger fish returning in 1996 and 1997. At an average of 20 pounds per returning chinook, Chenega Bay residents can expect to harvest 40,000 pounds of salmon annually. The residents of Chenega and local commercial and sports fishermen will be the principal beneficiaries because of their proximity to the proposed release site.

C. Methods

Beginning the spring of 1994, 50,000 chinook salmon smolts will be taken from the Wally Noerenberg Hatchery operated by Prince William Sound Aquaculture Corporation (PWSAC) and transported to the release site via barge and special tank carrier. The smolts will then be fed and reared for approximately two to three weeks before being released to the marine environment. Technical support for the incubation, hatching, and feeding of the salmon will be provided by PWSAC. Harvest of the adult salmon will be done by village residents.

D. Location

The location for the release is in Crab Bay, located near the village of Chenega Bay.

E. Technical Support

Technical support for the project will be provided by PWSAC. Feeding at the release site will be accomplished by the residents of Chenega.

F. Contracts

Contracts to implement the release program are as follows:

1. Contract with PWSAC for the delivery of healthy smolt to the release site.

2. Contract between PWSAC and Chenega Corporation for the fabrication of the net pens (if specifications for the net pens permit local fabrication).

3. Contract between Chenega Corporation and PWSAC for the feeding of smolt and the proper placement of the net pens.

SCHEDULES

The schedule for the proposed project is as follows:

Activity	Begin	Complete
Egg Take	7/92	8/92
Incubation	8/92	3/93
Outmigration	3/93	4/93
Rearing	4/93	5/94
Fabricate Net Pen	3/94	5/94
Transporting	5/94	6/94
Set Net Pen	5/94	5/94
Feed & Imprint Smolts	5/94	6/94
Release Smolts	6/94	6/94

Dismantle/Remove Net Pen	6/94	6/94

EXISTING AGENCY PROGRAM

None.

ENVIRONMENTAL COMPLIANCE/PERMIT/COORDINATION STATUS

The National Oceanic and Atmospheric Administration (NOAA) is lead Federal agency for National Environmental Policy Act (NEPA) compliance for this project. The project requires an Environmental Assessment (EA). That EA is presently being developed. Permits, forms for completion and approval, and fees which may be required to conduct this salmon release program include:

1. ADF&G hatchery permit alteration request (PAR)
2. ADF&G fry transport permit (FTP)
3. Alaska Coastal Management Program Coastal Project Questionnaire (DCG)
4. Tidelands Use permit, Alaska Department of Natural Resources (ADNR)
5. COE permit for anchoring structures
6. Letter of non-objection from upland owners (ADNR)
7. Insurance certification (ADNR)
8. Bond, CD, or certified check (ADNR)
9. Annual fee (ADNR)
10. Document handling fee (ADNR)

PWSAC will obtain all necessary permits.

PERFORMANCE MONITORING

The number of adult chinook returning annually to Crab Bay will indicate the degree of sccess for the project.

FY94 BUDGET ($K)

AGENCY	ADF&G
Personnel	3.4
Travel	0.0
Contractual	50.0
Commodities	0.0
Equipment	0.0
Capital Outlay	0.0
Sub-total	53.4
General Administration	4
TOTAL	57.4
NEPA COMPLIANCE	0.0

EXXON VALDEZ OIL SPILL PROJECT DESCRIPTION

Title: Subsistence Food Safety Testing

Project Number: 94279

Lead Agency: ADF&G

Cooperating Agency: NOAA

Cost of Project, FY94: $176.1K ADF&G

Project Startup Date: October 1993 **Duration:** 1 year

Geographic Area: Prince William Sound, Kenai Peninsula, and Kodiak Island.

INTRODUCTION

Subsistence uses of fish and other wildlife constitute a vital natural resource service that was injured by the *Exxon Valdez* oil spill. Data collected by the Alaska Department of Fish and Game's (ADF&G) Division of Subsistence demonstrated this injury. Annual per capita subsistence harvests declined dramatically (from 12 to 77 percent decline compared to pre-spill averages) in 10 of the communities in the path of the spill during the first year after the event. While some of these communities' harvests demonstrated a limited recovery in the second post-spill year, harvest levels in other affected communities showed no signs of recovery. Concern over the long-term health effects of using resources from the spill area, a loss of confidence on the part of subsistence hunters and fishermen in their own abilities to determine if their traditional foods are safe to eat, and a perceived reduction in available resources all contributed to the reduced harvest levels.

In 1993, the Trustee Council provided funding to restore the subsistence uses of fish and wildlife damaged by the spill. Community meetings were held in order to identify and map the specific areas and resources of continued concern to subsistence users. In 1993, samples of subsistence species representative of those cited in community meetings as being of continuing concern were collected from harvest areas identified during the community meetings. Community representatives assisted in site selection and the collection of samples. By January 1, 1994 the test results will have been presented during another series of community meetings. In 1994, the collection and testing of subsistence food samples will continue. Additional community meetings will be organized and informational newsletters produced to report the test results and provide health advice.

In the past couple of years, data from communities in the spill-affected area suggests that dissemination of information, community involvement, and food safety testing has had an effect. Subsistence harvest levels have increased, although they are still below pre-spill levels, and the number of households reporting as their primary concern the contamination

of their subsistence foods has decreased. A final year of hydrocarbon testing will contribute significantly to restoring confidence and subsistence harvests and will also allow the communities to be involved with the closure of this phase of the project.

PROJECT DESCRIPTION

A. Resources and/or Associated Services

The goal of the project is to restore the subsistence uses of fish and wildlife damaged by the spill. A return to greater use of subsistence foods could be beneficial for the physical and emotional health of community residents who have been thrust into an increased reliance on commercially prepared food due to a distrust of traditional subsistence food sources following the spill. The aversion to commercially prepared food applies especially to the elders, who were the most accustomed to subsistence resources through a lifetime of reliance on locally-harvested wild resources. Younger people will also benefit, as a resumption of subsistence activities will allow them the opportunity to learn the skills necessary to live in these rural, subsistence-based communities.

This project answers the need to continue to monitor the risks to human health from the oil spill. This is consistent with the goal of restoring human services of the natural resources damaged in the oil spill. It also addresses the need to restore the natural resources and the services these resources previously provided to subsistence users.

B. Objectives

The primary objective is to restore subsistence harvest of fish and wildlife. This is the second year of a two and a half year project. The following dates refer to the completion of activities for fiscal year 1994. All subsistence food samples will be collected by September 30, 1994. Testing will be completed by November 30, 1994. The last round of community meetings to report test results and interpretations will take place in December 1994.

C. Methods

Community meetings will be held in the following 11 communities, Chenega Bay, Tatitlek, Nanwalek, Port Graham, Seward, Larsen Bay, Karluk, Old Harbor, Akhiok, Port Lions, and Ouzinkie, to identify specific harvest areas and resources of continued concern to subsistence users. Other communities may be added if such concerns are noted by Subsistence Division researchers during community visits. Those communities where no concern is indicated (by lack of attendance at the community meetings and lack of other communication) will be dropped from the study.

Samples of subsistence foods will be collected from representative harvest areas identified as either containing persistent oiling or of special importance to subsistence users. Most sampling sites will be sites not previously included in the project. Because uptake and

accumulation of hydrocarbons is influenced by temperature as well as the reproductive cycle, the fish and shellfish will be tested at different times of the year. There will be two sampling periods during the study; spring and fall. The selection of species for sampling will take into account concerns expressed in the community meetings, as well as the results of tests on the samples collected in 1993 Community representatives will again assist in site selection and the collection of samples.

As part of the 1993 project, bile and blubber samples were taken from 5 harbor seals, and samples of skin and internal organs were collected from 20 ducks. These samples came from animals harvested by subsistence hunters for food. The hunters were asked to write an evaluation of the general health of each animal, including condition of the liver and other internal organs. Test results from these samples will be available before the start of the 1994 field season. Based on these test results, the Subsistence Division, in consultation with the National Marine Fisheries Service's (NMFS) Northwest Fisheries Center Laboratory and the affected communities, will determine whether further testing of seals and ducks is warranted.

The collection of finfish and shellfish samples will be done by the Pacific Rim Villages Coalition (PRVC) under a cooperative agreement. If seal and duck samples are to be tested, the collection will be carried out by local subsistence hunters in cooperation with ADF&G personnel. Testing of all samples will be done by the NMFS Laboratory, to provide consistency with earlier studies undertaken by the Division of Subsistence and Exxon. The interpretation of test results will be undertaken by the Oil Spill Health Task Force.

The communication of test results and evaluation of the effectiveness of the program will be done by the Subsistence Division. Communication of the test results to residents of the impacted communities will require the production of a quarterly Subsistence Division newsletter. It is important that the findings of restoration studies be integrated into this communication effort. As this information is released, it is likely to cause renewed concern among subsistence harvesters. It is not always possible to anticipate the effect a technical report, or the media accounts derived from it, will have in these communities. The newsletter will serve to put this information in context for subsistence users, following an evaluation of the information by the Oil Spill Health Task Force. It will also be important to follow distribution of the newsletter with formal and informal community visits. The purpose will be to develop a dialogue between the researchers and the communities regarding the study findings.

The Division of Subsistence, in cooperation with the Oil Spill Health Task Force and its other member organizations, successfully carried out a similar program for three years. The Task Force called together a Toxicological Expert Committee, which was able to formulate health advice for subsistence harvesters in the oil spill impact area. Through the Oil Spill Health Task Force newsletter, this information was communicated to the affected communities. However, the work is not complete. The limited access to damage assessment studies created the impression in most communities that the task force did not base its conclusions on a complete assessment of all data.

By involving subsistence users in decisions affecting mitigation, and the monitoring, enhancement, and replacement of the natural resources, the recovery of the resources upon which subsistence users rely will be accelerated. There is a need in these communities to actively participate in restoration of the environment. This project provides for such involvement. This, combined with effective communication of information concerning the safety of the resources, should cause subsistence harvests to begin to approach pre-spill levels and reduce anxiety about their use. If this occurred, it would lead to a reduced reliance on commercially-purchased foods. It would also restore the communities' abilities to pass on skills and knowledge associated with using subsistence foods.

D. Location

Field work will be conducted at subsistence harvest areas in PWS, the Kenai Peninsula, and Kodiak Island. Samples will be tested and results analyzed in Seattle. The communities of Chenega Bay, Tatitlek, Nanwalek, Port Graham, Seward, Larsen Bay, Karluk, Old Harbor, Akhiok, Port Lions, and Ouzinkie will be involved. Other communities may be added if similar concerns are identified.

E. Technical Support

Hydrocarbon analysis will be conducted by the NMFS Laboratory in Seattle.

F. Contracts

Samples will be collected by the PRVC under a cooperative agreement. The PRVC is a coalition of the village corporations of Chenega Bay, Tatitlek, Port Graham, and Nanwalek and is endorsed by the village councils of the same communities. The subsistence uses of all of these communities were impacted by the spill. By working with the PRVC, community participation in the project will be increased. Typesetting and printing of four issues of an informational newsletter will be contracted by competitive bid.

SCHEDULES

February 1994	Informational newsletter issued
May 1994	Informational newsletter issued
June 1994	Collect subsistence food samples for testing
August 1994	Informational newsletter issued
September 1994	Collect subsistence food samples for testing
November 1994	Data summary, draft report (estimate 8 weeks for peer review), informational newsletter issued
January 1995	Final report on fiscal year 1994 activities

EXISTING AGENCY PROGRAM

The ADF&G Division of Subsistence maintains an ongoing program of monitoring subsistence harvests in communities throughout Alaska, including the spill area. The Division is currently involved in a joint project with the U.S. Minerals Management Service, which involves administering two surveys, one on subsistence and personal use harvests and the other on social effects of the spill. Information from this joint study will guide the subsistence restoration efforts.

ENVIRONMENTAL COMPLIANCE/PERMIT/COORDINATION STATUS

The National Oceanic and Atmospheric Administration (NOAA) is the lead Federal agency for National Environmental Policy Act (NEPA) compliance for this project. This project meets NOAA agency guidelines for Categorical Exclusion from the NEPA process.

A scientific collection permit will be obtained from the ADF&G to allow for the collection of fish and shellfish samples. Permits will not be needed to collect seal and duck samples since they will be taken from animals killed by subsistence hunters for food.

PERFORMANCE MONITORING

Four informational newsletters will be produced, summarizing project findings and test results. A final report and data summary will also be provided at the conclusion of fiscal year 1994 activities.

FY94 BUDGET ($K)

AGENCY	ADF&G	MFS	OAL
Personnel	95.3	95.0	190.3
Travel	25.0	0.0	25.0
Contractual	90.1	3.0	93.1
Commodities	2.0	33.7	35.7
Equipment	0.0	0.0	0.0
Capital Outlay	0.0	0.0	0.0
Sub-total	212.4	131.7	344.1
General Administration	20.6	14.5	35.1
TOTAL	233.0	146.2	379.2

NEPA COMPLIANCE 0.0

EXXON VALDEZ OIL SPILL PROJECT DESCRIPTION

Title: Subtidal Sediment Recovery Monitoring

Project Number: 94285

Lead Agency: NOAA

Cooperating Agencies: ADEC, ADF&G

Cost of Project, FY94: $629.2K **Cost of Project, FY95:** $129.3K

Project Startup Date: March 1993 **Duration:** 2 years

Geographic Area: Gulf of Alaska

INTRODUCTION

Subtidal sediments were found to be contaminated by oil at five locations in the Gulf of Alaska (GOA) in 1989. Although hydrocarbon contamination was usually confined to shallow sediments (0-3 m) in GOA, sediment contamination reached a depth of 20 m in at least one location (Chugach Bay). Recovery rates of subtidal marine sediments contaminated by petroleum hydrocarbons at the latitude of GOA are poorly known. Recovery to background levels of hydrocarbons in subtidal sediments at the contaminated sites in GOA should be investigated. The purpose of this project will be to determine the amount of oil remaining in the subtidal environment at the GOA locations formerly contaminated by oil and to compare that amount of oil with that at comparable locations in Prince William Sound.

This study will provide the first assessment since 1990 of the contamination of subtidal sediments by *Exxon Valdez* oil outside Prince William Sound (PWS). The study will provide information on environmental hydrocarbon concentrations of use to the study on subsistence food [Project #94279] and the clam study (Project #94081).

PROJECT DESCRIPTION

A. Resources and/or Associated Services

The resource that will be monitored is subtidal sediments in the bathymetric depth range of 0 to 100 m on Kodiak Island, the Kenai Peninsula, and the Alaska Peninsula. Demersal fish, benthic invertebrates, certain diving birds, and mammals prey on organisms associated with subtidal sediments. Investigators attempting to restore or monitor recovery of

populations of these organisms following the spill will need to know the concentrations of petroleum hydrocarbons present in these sediments.

B. Objectives

1. Determine the composition and concentration of petroleum hydrocarbons from the spill in intertidal and subtidal sediments (0-100 m) in the GOA by GC/MS.

2. Compare concentrations of hydrocarbons in subtidal sediments outside PWS with concentrations at comparable depths inside the PWS.

3. Compare concentrations of hydrocarbons in subtidal sediments outside PWS in 1994 with concentrations found at the same stations in 1989 and assess the extent of recovery of those sediments.

4. Complete hydrocarbon analysis of sediments collected in PWS in July 1993.

C. Methods

The methods will be similar to those employed for sediment sampling under the NRDA Subtidal Study #1. These methods are summarized briefly below. Sediment samples will be collected at one intertidal station and five subtidal stations. Intertidal collections will be made at a single tidal height in the range of +1 to -1 m relative to mean lower low water (MLLW) depending on the distribution of fine sediments. Three samples, each a composite of 8 subsamples, collected randomly along a 30 m transect laid parallel to the shoreline will be taken at each intertidal site. These samples will be collected at low tide or by divers.

Subtidal sediment collections will be made at 3, 6, 20, 40, and 100 m below MLLW. Collections at 3, 6, and 20 m will be made by divers on transects laid along the appropriate isobath and sampled in the same way as described above for the intertidal transects. Samples taken at depths below 20 m will be collected with a Smith-McIntyre grab. Three grabs will be taken at each depth. Four subsamples will be removed at randomly selected points within each grab. The subsamples will be combined to form one sample per grab.

All samples collected by hand (including those removed by hand from the Smith-McIntyre grab) will be taken from the surface (top 0-2 cm) of the sediment column. Samples taken by hand in the intertidal region will be collected using a chrome-plated brass core tube (3.6 cm inside diameter) and chrome plated spatula. Each subsample will be transferred to a sample jar using the spatula. The core tube and the spatula will be washed, dried and rinsed with methylene chloride between samples. Sample jars will be cleaned to EPA specifications for hydrocarbon sampling. The jars will be fitted with teflon lined caps also cleaned to EPA specifications. Samples will be placed in coolers with ice immediately after collection and will be frozen within an hour. Appropriate blanks will be collected at each site. Chain of custody procedures will be followed after collection of all samples.

D. Location

This project will be undertaken at 8 sites in the GOA (2 reference sites and 6 contaminated

sites) and 4 sites in PWS (2 reference sites and 2 contaminated sites). The sites will be Black Bay, Tonsina Bay, Windy Bay, Chugach Bay, Shuyak Bay, Hallo Bay, Katmai Bay, Wide Bay, Moose Lips Bay, Northwest Bay, Olsen Bay, and Sleepy Bay. All sites were sampled once in 1989 and in 1990 under the NRDA program (except for Wide Bay which was sampled only in 1989).

E. Technical Support

The project will require technical support in hydrocarbon chemistry (UV spectrophotometry and gas chromatography/mass spectrometry). The chemical analysis will be performed at the Auke Bay Laboratory.

F. Contracts

A contract will be required to charter a vessel capable of accommodating four scientists and equipped to conduct diving operations and operation of benthic grabs and with freezer space adequate for storing sediment samples. The contract will be awarded by competitive bid.

SCHEDULES

Sediment sampling will be conducted in July 1994. Chemical analyses will be completed by November 1994. Data compilation and analysis will be completed by March 1995. A progress report will be submitted in November 1994 and a final report will be completed by April 1995. A vessel charter will be required to support the field sampling (see Contracts above).

EXISTING AGENCY PROGRAM

The agency will contribute, partially, the management salaries of three investigators (about $34K). The project will pay the salaries required for field work, analytical chemistry and data analysis. During the period October 1, 1993 to September 30, 1994 the agency will complete hydrocarbon analysis, data compilation and analysis, and report writing for the field study conducted in Prince William Sound in July 1993.

ENVIRONMENTAL COMPLIANCE/PERMIT/COORDINATION STATUS

This project will fall under the categorical exclusion within NEPA. The project will involve routine environmental sampling for which no requirement to undertake National Environmental Policy Act review is necessary.

PERFORMANCE MONITORING

A project status report that will present the results of the field sampling and will give the progress on the chemical analyses and data compilation, analysis and interpretation will be submitted in November 1994. A final report detailing the distribution of petroleum hydrocarbons at previously contaminated sites in the northeastern Gulf of Alaska and comparing the concentrations with those at comparable depths at selected sites in PWS will be submitted by April 1995.

FY94 BUDGET ($K)

AGENCY	OAA	ADEC	ADF&G	OAL
Personnel	230.9	0.0	6.7	237.6
Travel	13.0	0.0	0.0	13.0
Contractual	60.0	20.0	198.8	278.8
Commodities	44.0	0.0	0.0	44.0
Equipment	0.0	0.0	0.0	0.0
Capital Outlay	0.0	0.0	0.0	0.0
Sub-total	347.9	20.0	205.5	573.4
General Administration	38.9	1.4	14.9	55.2
TOTAL	386.8	21.4	220.4	628.6

NEPA COMPLIANCE 0.0

EXXON VALDEZ OIL SPILL PROJECT DESCRIPTION

Title: Hydrocarbon Data Analysis and Interpretation

Project Number: 94290

Lead Agency: NOAA

Cooperating Agency: None

Cost of Project, FY94: $130.2K **Cost of Project, FY95:** $138.3

Project Startup Date: October 1, 1993 **Duration:** 6 years

Geographic Area: Oil Spill Impacted Area

INTRODUCTION

The Auke Bay Laboratory (ABL) has provided data archival and interpretive services for environmental samples that have been collected and analyzed for hydrocarbons in support of the *Exxon Valdez* NRDA and restoration efforts. The samples derive from all projects, investigators, and agencies (including both State of Alaska and Federal agencies) that have collected samples for hydrocarbon analysis. The general purpose of this project is to continue to make a large, comprehensive, hydrocarbon database available to Principal Investigators, resource managers, and the public by providing user-friendly services. The hydrocarbon database contains sample collection and chemical analyses information from thousands of samples from 1989 to the present. Briefly, the database contains:

A. Sample Collection

Information for >39,000 samples including major sample types of sediment, tissue, water, and oil.

B. Hydrocarbon Analysis

Information for >10,000 samples, each sample analyzed has results for 63 analytes plus quality assurance data.

C. Bile and HPLC Analysis

More than 2,000 samples.

D. Data in Support of NRDA and Restoration Projects Over the Period 1989-1993

This project will provide the following:

1. Continued use and access of NRDA and restoration hydrocarbon data

2. Expansion of the hydrocarbon database with new restoration data resulting in a consistent database allowing comparison of NRDA and restoration results.

3. Interpretation of hydrocarbon results for PI's managers, and the public.

4. Continued quality control of sample storage, and hydrocarbon analyses.

Interpretive services include hydrocarbon data interpretation to identify probable sources of hydrocarbons found, evaluation of new hydrocarbon data for evidence of systematic bias, hydrocarbon data editing according to consistent criteria and hydrocarbon data mapping to facilitate identification of temporal and geographic trends of these data. The results of these efforts provide numerical correlates that are directly related to oil, and that may be used by PI's of other Restoration projects, by other governmental agencies, and by the general public, to assess associations of observed biological effects with concentrations of *Exxon Valdez* oil. These archival and interpretive services have been provided by staff at ABL for hydrocarbon samples generated for the *Exxon Valdez* NRDA effort, who have developed automated computer methods to ensure that the various criteria are consistently applied to these data, and which result in computer-generated maps of the final results. The purpose of the presently proposed project is to integrate these additional data with the *Exxon Valdez* NRDA hydrocarbon database, and to continue to provide interpretive services, thereby ensuring that hydrocarbon data resulting from Restoration efforts are directly and unequivocally comparable with the existing data.

PROJECT DESCRIPTION

A. Resources and/or Associated Services

Data associated with hydrocarbon samples will be added to the existing *Exxon Valdez* database. Principle investigators from all projects collecting hydrocarbon samples will be assisted by this project through archival, interpretation, and mapping of their data. Data archival will include maintenance of a Rbase database with sample collection information and hydrocarbon results with future migration to an Oracle database server. This database allows inventory of hydrocarbon sample collection, and retrieval of collection and hydrocarbon results for PI and management use. Data interpretation will include examination of the data for evidence of systematic bias, which will provide the basis for an evaluation of data quality, and a probability based determination of sources of hydrocarbons found in samples. Finally, maps of specific hydrocarbon samples will be provided on request by principal investigators, government agencies, or the general public.

B. Objectives

The objective of this project is to continue to apply and extend hydrocarbon interpretation methods and data archival developed in NRDA assessments to samples analyzed for the Restoration effort, and to insure the comparability of analytical and interpretive results with those of the NRDA effort.

C. Methods

Procedures developed during the NRDA effort will be followed in this project. Incoming samples are inventoried and collection information is entered into a database located at Auke Bay. AK. Hydrocarbon results returned from analytical laboratories are also added to the database. Hydrocarbon data will be evaluated using methods described in the final reports of Exxon Valdez NRDA project Subtidal #8 (in prep.). These methods were developed specifically for *Exxon Valdez* NRDA hydrocarbon data.

D. Location

The project will be undertaken at the Auke Bay Laboratory in Juneau Alaska.

E. Technical Support

This project will provide it's own technical support including chemical, mapping and database needs.

F. Contracts

No contracts are anticipated.

SCHEDULES

This project is an ongoing service task and therefore has few set milestone dates. All of the methods, including computer software written specifically for these tasks, have already been developed, tested, and applied. The requested funds are entirely for continuation of these services for additional data that will be produced by Restoration projects. A final examination of hydrocarbon data will be performed for all hydrocarbon data received as of September 15, 1994, and will be summarized in a report that will be completed by September 30, 1994. Interpretations and maps of hydrocarbon data will be provided on request. Sample data entry and interpretation depend on the timeframe of sample receipt, and analysis.

EXISTING AGENCY PROGRAM

ABL will contribute, partially, the salaries of the Habitat Program Manager, other ABL P.I.'s, and chemists for policy and management of the database and hydrocarbon interpretation ($37K).

ENVIRONMENTAL COMPLIANCE/PERMIT/COORDINATION STATUS

This is not a field study nor does it have any significant effect on the environment. Consequently, an Environmental Impact Statement or Environmental Assessment need not be provided.

All federal, state, and local laws are followed in the management of chemical analysis.

PERFORMANCE MONITORING

The portion of this project examination of hydrocarbon data for systematic bias is, in itself, a performance monitoring function. The performance of the methods developed for examination and interpretation of these hydrocarbon data have already been verified. Database integrity is assured by signed reviews of data entered by principal investigators. We will continue to follow all quality assurance procedures outlined in NRDA efforts.

FY94 BUDGET ($K)

AGENCY	OAA
Personnel	104.5
Travel	4.0
Contractual	0.0
Commodities	3.5
Equipment	2.5
Capital Outlay	0.0
Sub-total	114.5
General Administration	15.7
TOTAL	130.2
NEPA COMPLIANCE	0.0

EXXON VALDEZ OIL SPILL PROJECT DESCRIPTION

Title: Prince William Sound System Investigation

Project Number: 94320

Lead Agency: NOAA

Cooperating Agencies: ADF&G

Cost of Project, FY94: $6,052.5K ADF&G

Project Startup Date: January 1994 **Duration:** Multi-year

Geographic Area: Prince William Sound

INTRODUCTION

The Prince William Sound (PWS) System Investigation project is a directed study of the PWS ecosystem that will provide information essential to the restoration mission of the *Exxon Valdez* Oil Spill Trustee Council. The knowledge gained by implementing this project is vital to determining the feasibility of, and the approach to, restoring many resources and services injured by the *Exxon Valdez* oil spill. Resources to be addressed by the project include pink salmon, herring, and the principal species interacting with these fishes. These pelagic organisms support a host of birds and mammals, some which have also been described as injured species. Services addressed include subsistence, commercial fishing, recreation and tourism, and passive use.

The PWS System Investigation project is an outgrowth of work initiated by the PWS Fisheries Ecosystem Research Planning Group, comprised of the scientists, communities, managers and resource users of the Sound. Plans for the project were developed with the encouragement and support of the Trustee Council to provide an understanding of important ecological influences on injured resources and services. An initial draft plan concept (with related technical information) was reviewed by independent scientists and representatives of the EVOS Trustee Council at a workshop in December 1993, and was generally supported as innovative, reasonable, and scientifically testable. Future expansion of the PWS System Investigation project will involve coupling pelagic and nearshore benthic ecology and linking aquatic and terrestrial ecology through dominant ecosystem pathways.

The fundamental approach of the project is to investigate the interacting predator-prey resources and the fluctuating physical-chemical environment in which they live in order to explain some of the variation in productivity of specific animal populations. Developed in cooperation with the PWS Aquaculture Corporation, this project includes funding

(approximately $1.5 million) to support the cost of experimental hatchery releases that will be part of the research design.

There is a widely recognized need to understand and separate anthropogenic and natural effects on the variability of the PWS ecosystem. In recent years, poor runs of both pink salmon and herring, and the decline in seabirds and some marine mammals, have drawn attention to the need to initiate long-term ecological studies. The PWS System Investigation project will focus on pink salmon and herring as important components of the marine ecosystem while looking at the entire community of species that interact closely with pink salmon and herring in PWS. Accordingly, the PWS System Investigation project encompasses the interactions of climate and ocean currents, their effects on plankton and fishes, and the distribution and diet of apex predators on fishes.

PROJECT DESCRIPTION

A. Resources and/or Associated Services

The PWS System Investigation project will provide ecosystem level information, that is now lacking, about injured pink salmon and herring populations in PWS. This information will assist the *Exxon Valdez* Trustee Council in restoring these resources and associated services to pre-spill conditions. Although designed around the biology of these fisheries resources, the ecosystem approach to research will result in information relevant to the restoration of other injured resources throughout the oil spill affected area. The PWS System Investigation project will provide a better understanding of processes regulating the size of the pink salmon and herring spawning populations available to apex predators such as birds, marine and terrestrial mammals, and humans. Initial collaborations in 1994 and further planning work to be implemented beginning in 1995 will expand the PWS System Investigation project to address the roles of sea birds, marine mammals, the intertidal community, the benthos, and ecotoxicological factors in the marine system, and on building connections to ongoing projects already working in these areas.

B. Objectives

The goal of the PWS System Investigation project is to develop an ecosystem level understanding of natural and man-caused factors influencing the production of pink salmon and herring in PWS. The project is designed to provide information essential to more accurately forecast production, predict population responses to ecosystem disturbances (natural and anthropogenic), and help further guide restoration efforts for resources injured by the oil spill.

As a multi-disciplinary, integrated study, the PWS System Investigation project is designed to

achieve a number of objectives, including:

- Describe the oceanographic and meteorological mechanisms that interact to establish levels of food for juvenile pink salmon, herring, and other species with similar feeding behavior (planktivores) in PWS each year;

- Determine how prey/predator relationships affecting survival of juvenile pink salmon, herring, and other fish with similar predators are modified by both seasonal and year-to-year changes in upper-layer plankton stocks;

- Determine how physical processes affect the natal habitats (egg and larva incubation sites) for pink salmon and herring and contribute to losses of eggs, embryos and alevins;

- Describe ecological factors responsible for juvenile herring condition and overwinter survival in PWS;

- Integrate the PWS System Investigation project with research encompassing (1) sea birds and mammals, (2) intertidal communities and processes, (3) benthic processes, and (4) ecotoxicological pathways;

- Cooperate with Prince William Sound Aquaculture Corporation for an experimental fry release to support ecosystem research objectives; and

- Plan and realize a multi-disciplinary, long-term, ecosystem research program in Prince William Sound involving area residents, resource users, aquaculture corporations, educators and students, and industries in cooperation with area scientists and managers.

C. Methods

The PWS System Investigation project will be undertaken as a multi-disciplinary effort that will rely on a combination of monitoring, interpretation, prediction, and sensitivity/risk analysis that uses vessel and sea-side facilities in Prince William Sound for data collection and logistical support together with remote sensing. The project will rely heavily on private vessels (e.g., fishing, ecotourism, industry) outfitted with scientific equipment, and some use of agency and university scientific vessels. Salmon hatcheries in the region will provide spring and summer plankton data and year-round measurements of local weather and ocean conditions. These facilities will be supplemented by satellite-linked buoys, oceanographic moorings, and aircraft and satellite measurements.

The PWS System Investigation project will investigate the hypothesis that the recruitment success of pink salmon and herring populations in PWS is related to losses due to physical

processes and to predation during early life stages (embryo to late juvenile) that occur within PWS. This hypothesis provides a means to focus field efforts on those parts of the ecosystem that support these critical life stages. Previous studies of PWS indicate that the important early portions of the marine production cycle are tightly compressed in time around the months of April and May. During this period, massive upper-layer stocks of large zooplankton arise from the deeper water to graze on a short-lived diatom bloom. Herring spawning and the wild and hatchery-reared pink salmon out-migration occurs at this time as well. The PWS System Investigation project will examine whether the success or failure of a pink salmon (and to some extent) a herring brood year depends on ecosystem level interactions at this time. These interactions include oceanographic and meteorological influences, prey/predator relationships, physical effects, and mortality associated with toxic pollutants and diseases.

It is intended that standard oceanographic methods will be employed to describe changes in upper layer and deep ocean circulation in PWS and the bordering shelf of the Gulf of Alaska. Measurements will be designed to relate the distribution and abundance of pink salmon and herring, their predators and their prey to environmental conditions. Meteorological and hydrological data will be used to assess the importance of wind and buoyancy forcing on oceanographic properties and animal distributions in PWS. Plankton productivity and the timing of plankton blooms will also be determined using standard oceanographic methods.

Pink salmon and herring predators will be identified from trawl collections along the migratory pathways for both species while experimental releases of hatchery juveniles will provide a powerful test of the influence of ocean-entry timing and of fry size at ocean entry on losses to predators. Initial work will focus on predation by fish, although further work examining predation by birds and mammals is being planned for the future.

Studies of the natal habitats of pink salmon and herring will be undertaken to determine how the watershed characteristics influence losses to scouring, low oxygen, wave energy, desiccation, and freezing. Spawning habitats (streams, beaches, kelp beds) will be typed by physical, biological and microclimatic properties. Meteorological and hydrographic data will be measured over a broader scale using on-site and remote sensors to predict survival and the timing of ocean entry.

The roles of food availability and winter severity in regulating the overwinter survival of juvenile herring will be examined. Herring condition will be assessed from samples obtained during hydroacoustic and trawl surveys. Ocean temperature will be obtained as described above. Laboratory studies of metabolic rates and behavior will be used with models to examine the relationship between herring condition, starvation, and losses to predation.

The initial plan for the PWS System Investigation project focuses on the fisheries resources in PWS. The Trustee Council sponsored December 1993 workshop identified four areas where further information would be valuable in understanding, managing and restoring the ecosystem:

(1) sea birds and mammals, (2) intertidal communities and processes, (3) benthic processes, and (4) ecotoxicological pathways. Efforts to address components of the birds, mammal, and intertidal communities, and the ecotoxicology in these communities, are being coordinated between PWS System Investigation project and researchers active in these areas. Planning will continue through a series of meetings between agency, independent, and academic scientists, resource users, managers, industry, and local communities, together with continued integrative workshops.

The appropriate mix of acoustic, optic, and remote sensor equipment needed for implementation of the PWS System Investigation project is being determined as part of the detailed work plan development process under the guidance of the Trustee Council Chief Scientist and other peer reviewers. At this point, a phased implementation with a focused 1994 study effort in western Prince William Sound is contemplated, followed by expansion in the future to other areas.

D. Location

This project will be conducted within the EVOS-impacted area in PWS and the waters immediately adjacent to this region. PWS is an ideal location for such a long-term ecosystem study. The Sound is a semi-enclosed basin, of tractable size, and suitable for sampling and monitoring with small vessels.

E. Technical Support

The PWS System Investigation project involves an unprecedented collaboration between non-profit research organizations including the University of Alaska Fairbanks, PWS Science Center, PWS Aquaculture Corporation and government agencies. It includes a diverse group of scientists that are well versed in acoustical and optical technologies, physical and biological oceanography, quantitative aquatic ecology, population dynamics and mathematical modeling.

F. Contracts

A number of contracts for implementation of the project are anticipated to conduct the oceanography, meteorology, plankton dynamics, remote sensing, modeling and predation studies.

SCHEDULE

The PWS System Investigation project is a long-term project to be implemented in several phases:

- an initial 1-2 year phase of model development, planning, and field surveys;
- an intensive 4-5 year phase of field and laboratory studies focused on production and trophic interactions, and model testing and improvement; and
- an extended phase of less intensive sampling, monitoring and model validation, and perhaps involving adaptive management manipulations of stocking and harvest practices.

In general, the annual schedule will include activities listed in Table 1.

Table 1: Generalized Annual Schedule

January-February	Stage for the field season
March-July	Full-scale field studies re: marine production cycle
August-December	Sample processing, data assessment
November	Macrozooplankton overwintering survey
December-February	Herring overwintering studies
December-February	Annual report preparation

ENVIRONMENTAL COMPLIANCE/PERMIT/COORDINATION STATUS

This project should qualify for a categorical exclusion under NEPA.

FY94 BUDGET ($K)

AGENCY

Personnel				
Travel				
Contractual				
Commodities				
Equipment				
Capital Outlay				
Sub-total	0.0	0.0	0.0	0.0
General Administration				
TOTAL	0	0	0	0

NEPA COMPLIANCE

EXXON VALDEZ OIL SPILL PROJECT DESCRIPTION

Title: Waste Oil Disposal Facilities

Project Number: 94417

Lead Agency: ADEC

Cooperating Agency: None

Cost of Project, FY94: $232.2K ADEC

Project Startup Date: February 1, 1994 **Duration:** Multi-year

Geographic Area: Prince William Sound and the Gulf of Alaska

INTRODUCTION

Vessels in Prince William Sound and the Gulf of Alaska, especially in the zone affected by the *Exxon Valdez* oil spill, generate large quantities of used motor oil and other lubricants. In spite of regulations and enforcement actions to the contrary, a substantial (but unknown) amount of this waste oil finds its way into the marine environment. During the recovery phase of the spill it is desirable to eliminate additional sources of hydrocarbon contamination to the marine environment. The ports of Whittier, Homer, Seward, and Valdez all support increasingly large fleets of pleasure and recreational craft in addition to the resident and transient commercial fishing fleets. Cordova and Kodiak are seasonally among the busiest fishing ports on the West Coast. Villages such as Tatitlek, Chenega Bay, Port Graham, English Bay, and the Kodiak Island villages are home port for small-scale commercial fishing and subsistence-use vessels.

Proper disposal of used oil has long been viewed as a problem throughout the area. Handling, storage, and transportation of used oil has carried considerable cost and potential liability, especially under now-outdated federal regulations that routinely placed almost all waste oil under hazardous waste handling regulations. While some communities have waste oil collection facilities, others do not. Even at these few sites with collection facilities what to do with the waste oil once it is collected remains a major problem.

Nationwide, regulatory and financial issues have discouraged people from properly disposing of waste oil; more often than not, waste oil was illegally dumped in landfills, sewer systems, or other open sites. In 1992, the U.S. Environmental Protection Agency (EPA) estimated that 170 million of the 190 million gallons of waste oil generated in the nation found its way into the environment due to improper disposal; this represents approximately 16 times the amount of oil spilled by the *Exxon Valdez*. On August 12, 1992, EPA changed its

classifications regarding waste oil recycling and disposal, eliminating many of the regulatory disincentives frustrating the development of good waste oil handling and disposal in the nation.

The change in federal rules offers the Trustee Council an opportunity to support a project that would reduce the amount of waste oil entering the marine environment in the area affected by the *Exxon Valdez* oil spill. Reducing or eliminating other sources of hydrocarbon contamination in the spill area is desirable as it will help resources injured by the spill recover quickly.

PROJECT DESCRIPTION

A. Resources and/or Associated Services

The entire restoration effort would be enhanced by the successful implementation of this project. By providing an environmentally acceptable method of waste oil disposal the continuing introduction of hydrocarbons into the marine environment would be reduced thus permitting natural recovery to continue as quickly as possible.

B. Objectives

To reduce the incidental introduction into the spill area ecosystem by providing a preferred method of disposal of waste oil products.

C. Methods

This project would create a waste oil recycling and/or disposal pilot program in a few communities that wish to participate. Depending on the success of the program this year, it will be proposed for expansion in future years. Communities could propose to use marine pollution control grants from the Trustee Council to purchase equipment for recycling and/or disposing of waste oil depending on what method(s) the community felt most appropriate to the local conditions. Volume of waste oil, distance from recycling centers, the need or opportunity for re-use of oil, and the costs (in terms of both money and mechanical complexity) of continuing operation would be among the criteria used to evaluate proposals from the communities.

Communities wishing to participate in this program would submit proposals. An evaluation committee would review the applications for technical and regulatory feasibility. Awards would be made and the communities would begin installation.

These facilities would be wholly owned by the local organization or government that applied for the funding. Maintenance and operation would be paid by the communities through user

fees, assessments, or cost-recovery plans (e.g., reuse of waste oil for heating municipal facilities) depending on the wishes and resources of the communities. The facilities would be monitored, information collected, and a report prepared detailing the success or failure of the project.

D. Location

Communities within the spill affected area.

E. Technical Support

A small amount of computer support would be required in collecting the data reported by the grantees and storing it in a data base. The information would be utilized in preparing a report for the Trustees as to the relative success of the project.

F. Contracts

Six contracts (or grants) will be let for the best project proposals. A contract with an accounting firm to oversee expenditures and pay appropriate bills incurred by participating communities will be needed.

SCHEDULES

February 1994	Prepare proposal packets and scoring criteria
March 1994	Send out proposal packets to communities and advertise
April 1994	Receive submittals, convene proposal evaluation committee, review and rank proposals, notify recipients, negotiate grant/contract awards
May - June 1994	Communities proceed with equipment purchases and development
July - August 1994	Project manager visit communities
September 1, 1994	Receive first project reports from communities
December 1, 1994	Receive second operations report from communities

EXISTING AGENCY PROGRAM

None

ENVIRONMENTAL COMPLIANCE/PERMIT/COORDINATION STATUS

The Trustee Council would provide grants to individual communities. Contract/grant stipulations would require that these communities comply with all applicable NEPA regulations.

PERFORMANCE MONITORING

On-site visits will be made by the Project Manager. Fiscal oversight will be contracted with an accounting firm. Participating communities will develop individual reports. Individual reports will be compiled into a formal report for submission to the Trustees.

FY94 BUDGET ($K)

AGENCY	ADEC
Personnel	49.6
Travel	19.9
Contractual	142.9
Commodities	2.4
Equipment	0.0
Capital Outlay	0.0
Sub-total	214.8
General Administration	17.4
TOTAL	232.2

NEPA COMPLIANCE 0.0

EXXON VALDEZ OIL SPILL PROJECT DESCRIPTION

Title: Restoration Plan NEPA Compliance

Project Number: 94422

Lead Agency: USFS

Cooperating Agencies: ADF&G, DOI, NOAA

Cost of Project, FY94: $343.4K

Project Startup Date: February 1, 1994 **Duration:** Eight months

Geographic Area: Prince William Sound, Gulf of Alaska, Kenai Peninsula, Kodiak Archipelago, Alaska Peninsula

INTRODUCTION

This project will analyze the environmental effects of implementing the Draft Restoration Plan developed over the past two years, develop alternative Restoration Plans and disclose the effects in an Environmental Impact Statement. Federal law requires an Environmental Impact Statement for major federal actions significantly affecting the quality of the human environment. The Trustee Council have agreed that the Restoration Plan constitutes a major federal action and an Environmental Impact Statement is required before adopting a Final Restoration Plan.

PROJECT DESCRIPTION

On October 8, 1991, a federal court approved settlement between the State and Federal governments and Exxon under which Exxon will pay over $1 billion in criminal restitution and civil damages to the governments. The State and Federal Trustees will receive $900 million in civil damages from Exxon over 10 years. The funds are to be used to restore to their pre-spill condition the natural resources and the services they provide, that were injured by the *Exxon Valdez* oil spill. This includes the restoration of any natural resource injured, lost or destroyed and the services provided by that resource or which replaces or substitutes for the injured, lost or destroyed resource and affected services. Restoration includes all phases of injury assessment, restoration, replacement, and enhancement of natural resources, and acquisition of equivalent resources and services.

All decisions about restoration and uses of restoration funds are determined by six natural resources Trustees, three Federal And three State. The three Federal Trustees are: The

Administrator for the National Oceanic and Atmospheric Administration, U.S. Department of Commerce, and the Secretaries of the Department of Agriculture and of the Interior. The three State Trustees are: The Commissioners of Fish and Game and Environmental Conservation, and the Attorney General. A Trustee Council, located in Alaska, which is made up of designees of the Federal Trustees and the three State Trustees, is responsible for all decisions relating to the assessment of injuries, uses of the restoration funds, and all restoration activities including the preparation of a Restoration Plan.

On April 10, 1992 (57 FR 12473-12475) the Forest Service published a Notice of Intent to prepare an EIS on the Restoration Plan. Since then the Trustee Council has developed a draft Restoration Plan which has become the proposed action for the analysis to be conducted in the EIS. The Forest Service has subsequently updated this Notice on January 14, 1994.

The proposed action (Draft Restoration Plan) consists of nine policy statements, a discussion of categories of restoration actions and broad objectives for injured resources. The policies for identifying and conducting restoration actions are:

1. The restoration program will take an ecosystem approach.

2. Restoration activities may be considered for any injured resource or service.

3. Most restoration activities will occur within the spill area. However, restoration activities outside the spill are, but within Alaska, may be considered when the most effective restoration actions for an injured migratory population are in a part of its range outside the spill area or when the information acquired from research and monitoring activities outside the spill area will be important for restoration or understanding injuries within the spill area.

4. Restoration activities will emphasize resources and services that have not recovered. Resources and services will be enhanced, as appropriate, to promote restoration. Restoration projects should not adversely affect the ecosystem.

5. Projects designed to restore or enhance an injured service must have a sufficient relationship to an injured resource; must benefit the same user group that was injured; and, should be compatible with the character and public uses of the area.

6. Competitive proposals for restoration projects will be encouraged.

7. Restoration projects will be subject to independent scientific review before Trustee Council approval.

8. Meaningful public participation in restoration decisions will be actively solicited.

9. Government agencies will be funded only for restoration work that they do not normally conduct.

Four types of restoration actions are identified and discussed in the Draft Restoration Plan: general restoration, habitat protection and acquisition, monitoring and research, and public information and administration. Alternatives to the proposed action will place different emphases on each of these categories of restoration actions, while satisfying the policies and objectives for injured resources described in the Draft Restoration Plan.

General Restoration consists of activities that fall within manipulation of the environment and management of human use for reduction of marine pollution. Decisions about conducting general restoration projects would look at the following factors: Extent of natural recover, the value of an injured resource to the ecosystem and to the public, the duration of benefits, the technical feasibility of the project, the likelihood of success, the relationship of costs to expected benefits, potential for harmful side effects, benefits to more than one resource, effects on health and human safety, consistency with applicable laws, and policies, and duplication with other actions.

Habitat Protection and Acquisition is a category that included purchase of private land or interests in land such as conservation easements, mineral rights, or timber rights. It also includes recommendations for changing public agency management practices. Specific policies that relate to habitat protection and acquisition are proposed. These policies deal with ranking potential lands to determine potential benefits to injured resources and associated services, the need for a willing seller, purchasing at fair market value, post acquisition management of the acquired lands and involvement of the public.

Monitoring and Research consists of recovery monitoring, restoration monitoring and ecological monitoring and research. Specific policies governing the selecting and performance of monitoring activities are discussed in the Draft Restoration Plan.

Public Information and Administration is the last category of restoration actions. It consists of all necessary administrative actions that are not attributable to a particular project. The Draft Restoration Plan goal for this category is for administrative costs to average no more than 5% of overall restoration expenditures for the remainder of the settlement period.

General restoration objectives have been developed for resources that are recovering, resources not recovering, resources where the recovery is unknown, resources such as archaeological resources and wilderness, and services. These broad objectives will guide in the development of annual work plans.

Using an Interdisciplinary approach, the important issues that arise from the proposed Restoration Plan will be analyzed and alternative restoration plans developed. These

alternatives will be analyzed and a draft Environmental Impact Statement will be written and made available to the public and Trustee Council. The public and agencies will be invited to comment on the Draft Environmental Impact Statement. After the comments are analyzed and the draft statement revised a Final Environmental Impact Statement will be issued. The Trustee Council will then be able to adopt a Final Restoration Plan.

A. Resources and/or Associated Services

The Restoration Plan EIS will address all resources and services addressed in the Draft Restoration Plan. This includes bald eagles, black oystercatchers, killer whales, Sockeye salmon, common murres, harbor seals, harlequin ducks, marbled murrelets, Pacific herring, pigeon guillemots, pink salmon, sea otters, intertidal ecosystem, Subtidal ecosystem, clams, cutthroat trout, Dolly Varden, river otter, rockfish, archaeological resources, and designated wilderness areas. Services addressed will include subsistence, commercial fishing, and recreation and tourism.

B. Objectives

The objective of this project is to identify relevant issues from implementing the proposed Draft Restoration Plan, analyze the environmental and social consequences of implementing the Draft Restoration Plan and alternative Restoration Plans, and display the information in an Environmental Impact Statement.

C. Methods

An interdisciplinary team of State and Federal resource specialists will review available resource information, analyze the proposed action and alternatives, and write a Draft Environmental Impact Statement. The Draft will be released for 45 day public review, after which a final EIS will be developed and published.

D. Location

All of the analysis and writing will be conducted in Anchorage, Alaska.

E. Technical support

Federal and State agency personnel will provide technical expertise to assure compliance with National Environmental Policy Act requirements. Personnel will also be available to review resource reports and specific sections of the Draft and Final EIS to assure accuracy.

F. Contracts

Printing the Draft and Final Environmental Impact Statements will be contracted.

SCHEDULES

A Draft Environmental Impact Statement will be released for public comment in June 1994. The Final Environmental Impact Statement will be completed by September 30, 1994.

ENVIRONMENTAL COMPLIANCE/PERMIT/COORDINATION STATUS

None

PERFORMANCE MONITORING

The project team leader will be responsible for coordinating the all team members and assuring work is completed on time. Agency specialists will review draft products before the Draft EIS is to assure the document is accurate and complete.

CRITICAL MILESTONES FOR THE EIS

Date:	Benchmark to Be Accomplished
2/11/94	Interdisciplinary Team (ID Team) completed formulation of issues.
2/22/94	ID Team complete Purpose and Need, Chapter 1.
1/31/94	ID Team formulated an array of alternatives for the consideration of the Trustee Council (TC).
2/25/94	Array of alternatives approved by TC.
4/25/94	Interagency review of the Draft EIS. (starts 4/25, ends 5/6/94)
5/9/94	ID Team incorporates Agency comments.
5/23/94	DEIS goes to the printer.
6/18/94	Begin 45-day public review period for the DEIS. Hearings will need to be held.

8/l/94	End 45-day public review period for the DEIS.
8/12/94	TC selects alternative for the Final EIS.
8/12/94	Interagency review of the FEIS. This will be completed by 8/23/94
8/24/94	ID Team incorporates Agency comments.
9/12/94	Printing of the FEIS.
10/1/94	The FEIS 30-day appeal period begins.
10/17/94	Interagency review of R.O.D (ends 10/24/94).
10/31/94	Sign R.O.D.
11/1/94	Print R.O.D.
11/10/94	R.O.D. to EPA.

FY94 BUDGET ($K)

AGENCY

Personnel				
Travel				
Contractual				
Commodities				
Equipment				
Capital Outlay				
Sub-total		0.0	0.0	0.0
General Administration				
TOTAL		0	0	0
NEPA COMPLIANCE	0.0			

EXXON VALDEZ OIL SPILL PROJECT DESCRIPTION

Title: Oil Spill Public Information Center

Project Number: 94423

Lead Agency: ADF&G

Cooperating Agency: ADEC

Cost of Project, FY94: $136.5 ADF&G $111.6 ADEC

Project Starting Date: February 1994 **Duration:** Multi-year

Geographic Area: Spill Area

INTRODUCTION

The Oil Spill Public Information Center (OSPIC) was originally established by agencies of the federal government to be a repository for information and materials generated as a result of cleanup, damage assessment and restoration efforts following the Exxon Valdez oil spill. The OSPIC opened in September 1990 with a staff of professional librarians and library technicians employed by CACI, Inc., an information management firm.

After the settlement of the litigation between Exxon and the state and federal governments, the OSPIC was funded by the settlement money as part of the Administrative Director's budget. Restructuring by the Executive Director resulted in the transfer of staff and funding to the Alaska Departments of Fish and Game, and Environmental Conservation. The OSPIC is now funded as a project in the 1994 Work Plan.

The primary collection focus of the OSPIC is the *Exxon Valdez* oil spill and subsequent restoration activities, with a secondary focus on oil spills in the marine environment. The OSPIC collection includes information from numerous disciplines of the natural and social sciences, economics, and law, in a variety of formats, including books, technical reports, micro fiche, maps, audio and video tapes, slides, and computerized databases.

The OSPIC staff provides services which include research, preparation of bibliographies, and document delivery. During the past three years, the OSPIC staff has received over 5,900 visitors including visitors from 25 countries, responded to 7,500 on site/off site reference requests, processed 1,152 interlibrary loans, performed 1,102 online searches, and distributed 13,185 documents.

PROJECT DESCRIPTION:

The Oil Spill Public Information Center (OSPIC) supports the mission of the Trustee Council in its efforts to restore the injured environment and facilitates meaningful public participation in the restoration process as mandated by the settlement agreement between the state and federal governments and Exxon.

The OSPIC serves local, state, national, and international users, including but not limited to scientists, government agency personnel, the business community, students, educators, the legal profession, and other information providers.

A. Resources and/or Associated Services:

Through the information services it provides to all users, the OSPIC serves all restoration activities.

B. Objectives:

1) Maintain the Trustee Council Administrative Record.

2) Provide the Trustee Council and the Restoration Work Force with services including document distribution and specialized reference service.

3) Acquire new books, technical reports, maps, audio tapes, video tapes, journals, slides, and other materials pertaining to the Mission of the library to insure the OSPIC collection remains current and complete.

4) Organize the acquired materials so that users can access the collection.

5) Provide information and circulate materials to local, state, national, and international users.

C. Methods:

All OSPIC staff members respond to information requests made in person, by telephone, fax, mail, or interlibrary loan from around the world. The OSPIC also serves resident users, including the Executive Director, the Restoration Work Force, the Public Information Officer, and other agency personnel.

Materials acquired by the OSPIC staff are analyzed and described for entry into the OSPIC collection according to standard library practice. Materials are then made ready for the

shelves with appropriate physical processing.

The OSPIC collection is cataloged in the online database of the Western Library Network (WLN), a consortium of about 540 libraries in the western part of the United States, Canada, Australia, Korea, and Japan. Librarians from any member library can access OSPIC materials. Circulating materials are available for check out to Anchorage area residents, and via interlibrary loan to users outside the Anchorage area.

To conduct research and identify new items for acquisition, the OSPIC staff employs technology, including Dialog database services, and WLN's CD-ROM products, LaserCat and PolarPac. As a publicly funded library, the OSPIC will participate via the Alaska State Library in the Internet, a global network of over 10,000 computer networks in 85 countries linking 15 million users.

The OSPIC staff coordinates the distribution of the Natural Resource Damage Assessment Studies to 19 state and regional libraries and catalogs these reports in the WLN database. The OSPIC staff takes an active role in the publication of the NRDA final reports.

The OSPIC is a repository for documents produced for and by the Trustee Council, including meeting transcripts, budgets, work plans, and public comments. The Record is maintained as a certified Administrative Record to track the decision making process of the Trustees and to address issues of accountability.

D. Location:

The OSPIC is housed on the first floor of the Simpson Building at 645 G Street, Anchorage, Alaska.

E. Technical Support:

The analyst programmer provides routine maintenance of the LAN computer network and assistance in establishing a full text online service for the public.

F. Contracts:

Current contracts with vendors for information services, periodical subscriptions and equipment maintenance will continue.

SCHEDULES

The OSPIC as a project begins in February 1994.

EXISTING AGENCY PROGRAM

None.

ENVIRONMENTAL COMPLIANCE/PERMIT/COORDINATION STATUS

N/A

PERFORMANCE MONITORING

Quarterly and annual reports documenting usage, acquisitions, expenditures, and user information needs will be submitted by the designated deadline.

FY94 BUDGET ($K)

AGENCY	ADF&G	ADEC	TOTAL
Personnel			0.0
Travel			0.0
Contractual			0.0
Commodities			0.0
Equipment			0.0
Capital Outlay			0.0
Sub-total		0.0	0.0
General Administration			0
TOTAL		0	0

NEPA COMPLIANCE 0.0

PROJECT 94424 GOES HERE

PROJECT 94425 GOES HERE

PROJECT 94506 GOES HERE

EXXON VALDEZ OIL SPILL PROJECT DESCRIPTION

Title: Symposium Proceedings Publication

Project Number: 94507

Lead Agency: ADEC

Cooperating Agencies: ADF&G, ADNR, USFS, DOI, NOAA

Cost of Project, FY94: $69.0K ADEC

Project Startup Date: February 1, 1994

Geographic Area: Spill Area

INTRODUCTION

This project will publish the proceedings of the public symposium held by the Trustee Council in February, 1993. The symposium was a compilation of all available knowledge developed by the Trustees about the effects of the *Exxon Valdez* oil spill. The Council has been working since the symposium to publish the proceedings to make the results of the symposium available to a wide audience. This project will print the proceedings. Data from the publication of the symposium results will be used to help restore resources and services injured by the *Exxon Valdez* oil spill.

PROJECT DESCRIPTION

A. Resources and/or Associated Services

The information gathered and printed by this project will aid in restoration of resources and services injured by the spill. The current funding request is for closeout costs and publication of the data presented at the Trustee Council Oil Spill Symposium in February 1993.

B. Objectives

Disseminate information on the damage assessment studies to the public at a reasonable cost.

C. Methods

The data will be published by the American Fisheries Society. The actual costs of publication

are higher--restoration funds will be used to subsidize the cost in order to provide a wider distribution at a lower cost.

D. Location

Spill area.

E. Technical Support

None needed.

F. Contracts

Printing contract with the American Fisheries Society.

SCHEDULES

The Proceedings will be published by the end of 1994.

EXISTING AGENCY PROGRAM

None.

ENVIRONMENTAL COMPLIANCE/PERMIT/COORDINATION STATUS

This project is categorically excluded under NEPA.

FY94 BUDGET ($K)

AGENCY	ADEC	ADF&G	USFS	USDOI	NOAA	TOTAL
Personnel						0.0
Travel						0.0
Contractual						0.0
Commodities						0.0
Equipment						0.0
Capital Outlay						0.0
Sub-total	0.0	0.0	0.0	0.0	0.0	0.0
General Administration						
TOTAL	0	0	0	0	0	0

NEPA COMPLIANCE

EXXON VALDEZ OIL SPILL PROJECT DESCRIPTION

Title: Public Information and Administration

Project Number: 940ED

Lead Agency: All

Cooperating Agencies:

Cost of Project, FY94 690.7K ADF&G
$0.0K ADEC
$0.0K ADNR

Project Startup Date: October, 1994

Geographic Area: Spill Area

Public Information and Administration

The Trustee Council recently hired an Executive Director and implemented a new organizational structure designed to reduce costs, consolidate functions and streamline operations. In the past, administration and public information was distributed in four projects; it is now in one, with overall costs reduced by 20%. This project now has five components:

1. Chief Scientist & Peer Reviewers - The Trustee Council and the project principal investigators need access to the best possible scientific knowledge and understanding concerning injured resources and services. This information has been provided continuously by the chief scientist and expert peer reviewers since early in the injury assessment process started in 1989. It is essential that this expertise be retained on an upon-request basis to provide the unbiased scientific review and continuity essential to perform the best possible scientific work.

2. Executive Director's Office - The budget for the Executive Director includes salaries, benefits, travel, office space, supplies, printing costs, contractual services, utilities, and other such items as may be necessary for efficient operation of the Juneau office of the Executive Director and the Director of Administration. In addition to budget responsibilities, the Director of Administration is assuming the duties previously performed by the six-member Finance Committee: developing fiscal procedures, adherence to the procedures, and ensuring overall fiscal standards for accountability, and efficiency.

3. Operations - The budget for Operations includes salaries, benefits and travel for staff that perform the key planning, coordination and communications functions of the Trustee Council. These are existing positions that have been previously authorized, although many have been moved from a contract into the state system at a substantially reduced cost, and others have been given new position descriptions. This budget also includes funds for public meetings, Trustee Council meetings, newsletters, brochures and other publications, as well as the operating costs for offices in the Simpson Building in Anchorage.

4. Public Advisory Group - The Public Advisory Group consists of 17 members, plus two ad-hoc members from the State Legislature, representing 12 principal interest groups and five members from the public-at-large. The role of the PAG is to provide advice to the Trustee Council on such items as the annual work plans, budgets, and the Restoration Plan. The budget includes the administrative support expenses for the Group, including staff support, which is now being provided through the state in order to provide more user-friendly travel reimbursement.

5. Restoration Work Force - The six Trustees are supported by two staff each who function as agency liaisons, overseers of project solicitation and development, and project managers. The costs involved are salaries, benefits, travel, per diem, equipment and commodities. A Final 1994 Work Plan was approved January 31, 1994, and work is already underway on development of the 1995 Work Plan.

FY94 BUDGET ($K)

AGENCY			
Personnel			
Travel			
Contractual			
Commodities			
Equipment			
Capital Outlay			
Sub-total	0.0	0.0	0.0
General Administration			
TOTAL	0	0	0

NEPA COMPLIANCE