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1994 Work Plan

Project List

Number	Title	Lead Agency	Project Type	FY94 Budget
94007	Site Specific Archaeological Restoration	ADNR	General Restoration	\$599.5
94020	Black Oystercatcher Interaction with Intertidal	DOI	Monitoring and Research	\$17.3
94039	Common Murre Population Monitoring	DOI	Monitoring and Research	\$227.2
94041	Introduced Predator Removal from Islands	DOI	General Restoration	\$84,0
94043A1	Eshamy River Restoration (W. PWS) Total of \$186.2 was approved for all 94043 subprojects. Allocations to be determined.	USFS	General Restoration	
94043A2	Gumboot Creek Restoration (W. PWS)	USFS	General Restoration	
94043A3	Stream No. 508 Restoration	USFS	General Restoration	

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Number	Title	Lead Agency	Project Type	FY94 Budget
94043A4	Stream No. 509 Restoration (W. PWS)	USFS	General Restoration	
94043A5	Otter Creek/Lake Restoration (Knight I.)	USFS	General Restoration	
94043A6	Miners Creek/Lake Restoration (N. PWS)	USFS	General Restoration	
94043A7	Shrode Creek/Lake Restoration (W. PWS)	USFS	General Restoration	
94043B1	Sockeye Creek/Lake Restoration (Knight I.)	USFS	General Restoration	
94043B2	Rocky Creek/Bay Restoration (Montague)	USFS	General Restoration	
94064	Harbor Seal Habitat Use and Monitoring	ADFG	Monitoring and Research	\$270.2
94066	Harlequin Duck Recovery Monitoring	ADFG	Monitoring and Research	\$139.3

Number	Title	Lead Agency	Project Type	FY94 Budget
94086	Herring Bay Experimental and Monitoring Studies	ADFG	Monitoring and Research	\$729.4
94090	Mussel Bed Restoration and Monitoring	NOAA	General Restoration	\$681.1
94092	Killer Whale Recovery Monitoring	NOAA	Monitoring and Research	\$33.7
94102	Marbled Murrelet Prey and Foraging Habitat in Prince William Sound	DOI	Monitoring and Research	\$231.5
94110	Habitat Protection - Data Acquisition and Support	ADNR	Habitat Protection & Acquisition	\$678.7
94126	Habitat Protection and Acquisition Fund	ADNR	Habitat Protection & Acquisition	\$1160.3
94137	Stock Identification of Chum, Sockeye, Chinook, and Coho in	ADFG	General Restoration	\$261.6



Number	Title 1	Lead Agency	Project Type	FY94 Budget
94139A1	Waterfall Creek Bypass Instream Restoration Total of \$761.3 was approved for all 94139 subprojects. #A1 is only project for which allocation has been made.	ADFG	General Restoration	\$13.4
94139B1	Otter Creek Bypass Instream Restoration	USFS	General Restoration	
94139B2	Shrode Creek Bypass Instream Restoration	USFS	General Restoration	
94139C1	Montague Island Chum Instream Restoration	USFS	General Restoration	
94139C2	Lowe River (6.5 Mile) Instream Restoration	ADFG	General Restoration	
94159	Marine Bird & Sea Otter Boat Surveys	DOI	Monitoring and Research	\$107.0
94163	Forage Fish Influence on Recovery of Injured Species	NOAA	Monitoring and Research	\$606.6

Number	Title	Lead Agency	Project Type	FY94 Budget
94165	Herring Genetic Stock Identification in Prince William Sound	ADFG	Monitoring and Research	\$62.2
94166	Herring Spawn Deposition and Reproductive Impairment	ADFG	General Restoration	\$466.3
94173	Pigeon Guillemot Recovery Monitoring	DOI	Monitoring and Research	\$201.1
94185	Coded Wire Tagging of Wild Pinks for Stock Identification	ADFG	General Restoration	\$34.8
94191	Oil Related Egg and Alevin Mortalities	ADFG	General Restoration	\$782.9
94199	Institute of Marine Science - Seward Improvements	ADFG	Monitoring and Research	\$50.0
94217	Prince William Sound Area Recreation Implementation	USFS	General Restoration	\$76.3
94244	Harbor Seal and Sea Otter Co-op Subsistence Harvest Assistance	ADFG	General Restoration	\$34,5

Number	Title	Lead Agency	Project Type	FY94 Budget
			Manitoring and Desearch	\$307 4
94246	Sea Otter Recovery Monitoring	DOI	Monitoring and research	
94255	Kensi River Sockeye Salmon Restoration	ADFG	Monitoring and Research	\$406.1
94258	Sockeye Salmon Overescapement	ADFG	Monitoring and Research	\$854.9
94259	Coghill Lake Sockeye Salmon Restoration	ADFG	General Restoration	\$324.1
94266	Shoreline Assessment and Oil Removal	ADEC	General Restoration	\$403.1
20 N.				
942.72	Chenega Chinook Release Program	ADFG	General Restoration	\$57.4
94279	Subsistence Food Safety Testing	ADEG	General Restoration	\$379.2
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94285	Subtidal Sediment Recovery Monitoring	NOAA	Monitoring and Research	\$629.2

Number	Title	Lead Agency	Project Type	FY94 Budget
94290	Hydrocarbon Data Analysis and Interpretation	NOAA	Monitoring and Research	\$130,2
94320A	Salmon Growth and Mortality	ADFG	Monitoring and Research	\$263.4
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94320B	Coded Wire Tagging Recovery-PWS Pinks	ADFG	Monitoring and Research	\$244.4
94320C	Otolith Mass Marking of PWS Pink Salmon	ADFG	Monitoring and Research	\$53.9
94320D	Pink Salmon Genetics	ADFG	Monitoring and Research	\$171.2
94320E	Salmon Predation	ADFG	Monitoring and Research	\$907.1
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94320F	Harbor Scals-Trophic Interactions	ADFG	monuoring and research	320.9
94320G	Phytoplankton and Nutrients	ADEG	Monitoring and Research	\$141.5

Number	Title	Lead Agency	Project Type	FY94 Budget
94320H	Role of Zooplankton in PWS Ecosystem	ADFG	Monitoring and Research	\$300.1
943201	Food Web Dependencies in PWS Ecosystem/Stable Isotopes	ADFG	Monitoring and Research	\$60.5
012311	Information Systems and Model Development	ADEG	Monitoring and Research	\$756.5
773203				
94320K	PWSAC-Experimental Fry Release	ADFG	Monitoring and Research	\$40.0
94320L	PWSAC-Experimental Manipulation	ADFG	Monitoring and Research	\$1750.0
94320M	Physical Oceanography in PWS and Gulf of Alaska	ADFG	Monitoring and Research	\$773.1
94320N	Nearshore Fish	ADFG	Monitoring and Research	\$666.9
94320P	SEA Program: Program Management	ADFG	Monitoring and Research	\$51.8

Number	Title	Lead Agency	Project Type	<u>FY94 Budget</u>
94320Q	Avian Predation on Herring Swan	USFS	Monitoring and Research	\$84,8
943208	Disease Impacts on Herring	ADFG	Monitoring and Research	\$97.0
94417	Waste Oil Disposal Facilities	ADEC	General Restoration	\$232.2
94422	Environmental Impact Statement for the Draft Restoration Plan	USFS	Monitoring and Research	\$343.4
94423	Oil Spill Public Information Center (OSPIC)	ALL	General Restoration	\$248.1
94424	Restoration Reserve	DOL	Restoration Reserve	\$12000.0
94425	Marine Mammal Book	NOAA	Monitoring and Research	\$20.0
94427	Experimental Harlequin Duck Breeding Survey	ADFG	Monitoring and Research	\$21.0

Number	Title	Lead Agency	Project Type	FY94 Budget
94428	Subsistence Restoration Planning and Implementation	ADFG	General Restoration	\$99.1
94504	Genetic Stock Identification of Kenai River Sockeye	ADFG	General Restoration	\$262.2
94505	Information Needs for Habitat Protection	USFS	Habitat Protection & Acquisition	\$406.1
94506	Pigeon Guillemot Recovery	DOI	Monitoring and Research	\$13.9
94507	Symposium Proceedings Publication	NOAA	General Restoration	\$69.0

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EXXON VALUEZ TRUSTEE COUNCIL FY 94 DETAILED PROJECT DESCRIPTION

A. COVER PAGE

Project title: Site Specific Archaeological Restoration and Cultural Resource Protection - Interagency

Project ID number: 94007

Project type: Restoration/Protection

Name of project leader(s): Douglas R. Reger, Office of History and Archaeology, ADNR; Project Manager: Judith E. Bittner, Office of History and Archaeology, ADNR

Lead agency: Alaska Department of Natural Resources

Cooperating agencies: USDA Forest Service (John L. Mattson); USDI National Park Service (Ted G. Birkedal); USDI Fish and Wildlife Service (Charles E. Diters)

Cost of project/FY 94: 445.1

Cost of project/FY 95: 278.1 (estimated)

Cost of Project/FY 96 and beyond: -0-

Project Start-up/Completion Dates: May 1, 1994/ May, 1995

Geographic area of project: Prince William Sound, Cook Inlet/Kenai Peninsula, Kodiak/Alaska Peninsula regions

Name of project leader: Danglas R. Reger

Name of lead agency project manager: Judthe Bittmen



B. 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.

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:

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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 based on data supplied by Exxon Company contractors and a GIS/statistical study by the State University of New York, it is estimated that approximately112 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. 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.

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. The Alaska Department of Natural Resources visited the Port Dick Cabin Site, SEL-178, and returned to SEL-215 and SEL-220 in the Nuka Island area to monitor for vandalism and oiling. While at Nuka Island, investigators took advantage of the opportunity to check five additional sites for damage since earlier visits. On Shuyak Island, vandalism damage at AFG-081 was repaired, sediment samples retrieved from AFG-098, and current status documented at AFG-046. Four additional sites were visited while on Shuvak Island to monitor damages. National Park Service archaeologists documented current status and did some restoration at the Kaguyak Village Site (AFG-043), the McArthur Pass Site (SEL-188), and at the Cape Gull Cove Site (XMK-058), during the 1993 field season. U.S. Fish and Wildlife archaeologists visited four sites on Afoanak Island and one site on Spiridon Bay on the west side of Kodiak Island to fully document damages and effect restoration at the sites. The U.S. Forest Service attempted to contract with the Chugach Alaska Corporation to accomplish restorative action at three sites in Prince William Sound but unsurmountable delays cancelled those efforts.

During the 1994 field season, agency archaeologists will return-to the sites documented during 1993 and where additional restoration was proposed. Department of Natural Resources personnel will return to SEL-178, AFG-098, AFG-081, and AFG-046. SEW-440 was not visited during 1993 because of weather and lack of field time. That site will be visited and restoration accomplished or designed as necessary. The National Park Service will return to sites documented during 1993, particularly the Gull Cove Site (XMK-058), and perform restoration of damages on those sites. The U.S. Fish and Wildlife Service intends to return only to KOD-171 during 1994. Continuing vandalism at that site remains a significant problem. The U.S.D.A. Forest Service plans to contract for restoration of Crafton Island Cave (SEW-004) and to conduct restoration activities at SEW-440 and SEW-488 with agency personnel during 1994. The Crafton Island Cave portion of the project will use funding dedicated during the 1993 restoration cycle and to be re-authorized in 1994.

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. The project will involve preparation of possible alternatives, presentation of the options at local gatherings, and then design of several approaches to the goal of protection of local heritage. A part of the preparation of alternatives will be an estimate of costs for the various alternatives. The State Office of History and Archaeology, with the assistance of the other land managing agencies and others, will begin the public consultation and compilation process during late spring and early summer, 1994. A series of public presentations and discussions will be held in spill area communities and a detailed set of proposals will be prepared with cost estimates. During October and November 1994, local communities will again be consulted and opinions solicited. During December, 1994, through April, 1995, a set of recommendations will be compiled. The recommendations will be presented to the Trustees in May 1995.



C. 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 in earlier studies as impacted by vandalism or cleanup activities. Restoration examinations during the FY93 project provided draft plans for restoring the sites during FY94 or have initiated restoration to be continued during 1994 activities. Artifacts obtained during cleanup and damage assessment activities need to be preserved and stored as well.

2. **Relation to Other Damage Assessment/Restoration Work:** This project is based on damage assessment studies by Jesperson and Griffin, 1991 and Reger, et. al, 1992 (ARCH 1). The 1994 work plan builds also on the findings of restoration fieldwork done during 1993.

3. **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 March 31, 1994. Fieldwork will be initiated by June 1, 1994. The second objective is the compilation of Information about current site preservation programs relating to the oil spill, development of recommendations about preservation of artifacts from the spill activities and protection of injured archaeological sites. A written initial explanation of the intent of the second project objective will be sent to each of the communities to be consulted during the project. Draft suggestions for site and artifact protection programs will be prepared for community comment by October 15, 1994. Draft project reports for both objectives will be completed by December 31, 1994, and final reports completed by May 31, 1995.

4. **Methods:** The FY94 phase of archaeological site restoration will involve completing damage assessment at sites not previously examined adequately and restoration at sites where assessment was initiated or postponed during the FY93 phase. Restoration measures will operate under the following parameters:

- 1. Further analysis of injury will be pursued at sites with documented injury but with no major effort at identification of additional sites.
- Recovery, analysis, and curation (and where appropriate, repatriation) will be pursued for any remaining archaeological resources that were exposed or disturbed by oil spill related injury.
- 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 will be the aims of the project.

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. Agency specific activities during 1994 are described in attached appendices.

Following the guidelines established for the 1993 workplan, a three category approach to restoration will be recognized. The three categories described in the 1993 workplan included: (1) adequate investigation, assessment, and documentation of the original injury; (2) physical restoration of injury resulting from oil spill response activities, looting, and/or vandalism; and (3) monitoring of the direct effect of oiling. Procedures outlined here are the standard (in priority of importance) around which agencies will design their programs.

a. Assessment of Injury

The field damage assessment should address and document in detail the locations, extent, and nature of injuries and the archaeological resource injured. Complete field notes documenting the assessment are critical.

An accurate map of the site, documenting its present condition is necessary. The map should record topographic features, cultural features, distribution of exposed artifacts, test locations, location of mean high tide, erosion exposures, and locations of looting, vandalism, or other injury to sites. Site maps should approximate or exceed accuracy and detail shown in the attached example. A permanent datum and a secondary reference point will be established.

The current status of injury will be documented. An accurate measure of the extent of the injury, both horizontal and vertical, will be made. Additionally, an estimate of the area which will be subject to site restoration will be conducted. Necessary tests will be performed in the intertidal area for buried cultural material and oil contamination.

Stratigraphic profiles will be recorded in detailed drawings annotated with Munsell color descriptions.

Excavations made and data collected, through sediment sampling, artifact, collection, etc., will be recorded with three point provenance. Excavation techniques, screening and other methods used will be documented. A full photographic record of the current status of the site will be completed. Photograph stations will be marked and referenced to a permanent site datum. Photo records will include roll number, film type, frame number, subject, direction of view, date, time, and name of photographer. An estimate of archaeological value, cost of restoration, and damage assessment report will be prepared.

b. Emergency Restoration

If emergency restoration is appropriate following damage assessment, the techniques used should follow those generally recommended under the Archaeological Resources Protection Act (ARPA). Restoration may include controlled recovery and analysis of any disturbed archaeological resources. It may also include clearing off the face of injury exposures and excavation of small tests to determine the full extent of injury and site significance.

Restoration of looter or vandal excavations by back filling, ground contour reconstruction, and surface stabilization will include drawing stratigraphic profiles. The limits of the disturbed deposits will be marked prior to backfilling, such as by lining the hole with perforated plastic sheeting. Restoration may also include stabilization of the resource by installation of physical barriers or other protective devices to protect the site from further disturbance.

Proposals for future site restoration work need to be accurately plotted and keyed to the site status subsequent to the 1994 efforts. Estimates of the cost and site area involved will be calculated.-

c. Monitoring Oil Contamination and Sample Collection

Sediment samples will be collected from sites where contamination by oiling is suspected based on past observations or current observation. Samples will be collected from three locations within or immediately adjacent to the site boundary: one in the low intertidal, one in the mid intertidal, and one in the upper intertidal. Samples may be collected from above the high tide line as necessary. Sampling locations will be referenced to a permanent site datum by compass azimuth and distance recordation.

Small sample units, each about 20cm square, will be excavated at each sample location. Two primary samples will be collected from each unit, one from approximately 10cm below the surface and one from approximately 10 above the 'sterile base'. Duplicate samples similar to the primary samples will also be collected. Artifacts or other archaeological remains encountered during sampling will be recorded and collected using standard archaeological methods. Chemically cleaned 250ml sampling jars will be used to collect the sediment samples. The primary and duplicate samples will be collected using sterile tools. A label noting the sample number, date, time, location, and collector will be affixed to each sample jar. Duplicate samples will receive duplicate documentation with sample numbers being distinguished by assigning an 'A' postscript to primary samples and a 'B' postscript to the duplicate samples.

Sediment samples will be screened using a Hanby test kit to detect presence or absence of petroleum hydrocarbons in a small portion of the primary samples. If the preliminary screening detects presence of petroleum hydrocarbons, the remaining portions of the primary samples will be submitted to a laboratory for analysis by the HPLC/UV fluorescence method. That method will distinguish between broad categories of petroleum hydrocarbons but will not specifically identify Exxon Valdez crude oil. If such contaminant is strongly suspected a more expensive analysis for total petroleum hydrocarbon will be necessary.

d. Reports

Each participating agency will be responsible for the preparation of reports on its assigned portion of the work. These reports will adhere to content and editorial conventions of the Secretary of the Interior's Standards for Archaeology and Historic Preservation and the style guide of *American Antiquity*. Format for agency reports will follow the guidelines distributed by staff of the EVOS Trustee Council. Before the end of October 1994 each agency will prepare and submit an interim progress report on the results of the season's fieldwork. These individual reports will be compiled by DNR into a single document that will be introduced by a synthetic summary of the preliminary findings. Agency reports will be submitted to DNR in WordPerfect 5.1 or compatible format on computer diskette.

The preparation of a final report on the 1994 activities will await the completion of radiocarbon and other special analyses. These analyses, to be performed under contract, will take several months to complete, as will the curatorial work on the project's collected specimens and documentary record. A report on the curatorial work and the results of the special analyses will be incorporated into the final report. This report will be of publishable quality and undergo peer review prior to completion and submittal.

e. Curation of Collections

The collection of archaeological specimens will be kept to the minimum necessary to accomplish the proposed work. These specimens will include both artifacts and associated scientific specimens (e.g. soil samples, pollen samples, faunal material, etc.).

Once study of these specimens is completed, those items that have not been subjected to destructive analysis (i.e. radiocarbon samples for dating) will be managed and preserved as a unified collection according to the professional museum and archival standards and practices outlined in the *Curation of Federally-Owned and Administered Archaeological Collections*, 36 CFR Part 79. Curation is used here to refer to inventorying, accessioning, labeling, and cataloging collection. It also refers to the perpetual storage and maintenance of collections in using appropriate methods and containers, and under appropriate environmental conditions and physically secure controls.

All primary documentary records generated by the project, including those that will form the information base for the continued care and management of the archaeological artifacts and specimens, will also be curated. These archival records of the project together with the artifacts and specimens will make up the collections that will be placed in permanent curatorial care.

The combined collections derived from the work of all four of the participating agencies will be placed in a single, federally qualified curatorial repository. A repository was not selected for the 1993 collections, however, most oil spill associated collections have been accessioned at the University of Alaska Museum. The 1994 collections will be accessioned to that repository unless a more appropriate, but equally qualified, facility is identified. The ADNR, as lead agency for the project, will be responsible for arranging for a curatorial repository.

f. Special Analyses

The Alaska Department of Natural Resources will execute and administer all contracts for special analyses. Special analyses include the processing of radiocarbon dating samples and oil monitoring samples acquired in the course of the project.

g. Other Procurement Actions

Excepting the curation of archaeological specimens and special analyses, all other procurement actions necessary to the accomplishment of the project will be the responsibility of each of the four individual participating agencies. This includes the purchase of basic supplies, equipment, and any services necessary for repatriation of human remains, cultural patrimony, or unassociated funerary items.

h. Consultation with Interested Native American Groups

The repatriation and/or reinterment of any disturbed Native American human remains and related cultural items (per ARPA and NAGPRA) will be provided for. Contacts and consultation with Native American groups as required by 36 CFR 800, ARPA, and NAGPRA shall be the responsibility of the individual participating agencies. No field work will be performed prior to the accomplishment of these contacts and consultation. This activity is best handled by the individual agencies because each has its own established lines of communication with interested Native American groups and the individual agencies will be in the best position to provide information on their detailed work plans and field schedules.

Each agency is responsible for developing and implementing an individual plan for the work that will be conducted on the lands which they administer (for individual agency work plans see Appendix 1).

DNR will return to sites documented during 1993 and perform restorative measures. Those sites include AFG-046, AFG-081, AFG-098, SEL-178. SEW-440 was not visited during 1993 and the upland part of the site is being restored by the US Forest Service during 1994. DNR efforts to deal with restoration of intertidal remains will be coordinated with the U.S. Forest Service. DNR will

additionally perform coordination activities and arrange sample processing. Investigation of spill area cultural resource protection programs will be designed and coordinated by ADNR with cooperation of the federal land managing agencies.

USFS will direct restoration work at SEW-440 and SEW-488. Restoration of the vandal disturbed SEW-004 will be contracted by the USFS following standard agency procedures with



Figure 1. Sites to be visited during Project 94007.

federally qualified contractors. Restoration work at SEW-440 will emphasize documentation of significance of the site and extent of damage. USFS personnel will accompany the State in consultation visits to Prince William Sound communities while investigating local preservation program needs.

NPS will emphasize restoration of the vandal disturbed Cape Gull Site, XMK-058. SEL-188 will be re-visited to continue restoration begun during 1993. NPS personnel will accompany the State preservation program visits to communities with interests common with NPS management responsibilities.

USFWS will return to site KOD-171 where vandalism is a continuing agent of site damage. Restoration efforts begun during 1993 will be continued and USFWS personnel will coordinate with the State preservation program visits to communities in the Kodiak area.

5. Location:

The geographic area of the project includes the Prince William Sound, Cook Inlet/Kenai Peninsula and Kodiak/Alaska Peninsula regions. The specific locations of the sites which will be part of this project are subject to confidentiality restrictions. No restoration work will be conducted outside of federal or state land. In cases where there is multiple agency ownership of a particular site, the designated lead agency for that site will conduct the work. If part of the targeted site is in private ownership, all restoration work will be restricted to the agency-held portions of the site. The participating agencies may enter private land to gather information relative to the production of an overall site map, provided that the agency has obtained the express permission of the land owner.



6. Technical Support:

In addition to qualified archaeological field personnel, C14 dating, sample hydrocarbon analysis, and permanent curation of collected material (per 36 CFR 79), will require technical support.

7. Contracts:

Contracts for C14 dating, hydrocarbon analysis, and permanent curation of collected material are necessary to provide technical support not available in house. Those contracts will be administered by the Department of Natural Resources using standard State procedures. The US Forest Service has decided to contract restorative action at SEW-004 which will be administered under standard US Forest Service procedures and contracting policies in accordance with federal standards for professional qualifications of personnel. Contracts for film processing, air charter, boat charter and repatriation expenses from specific agency activities will be administered by the individual agencies, according to the appropriate contracting and procurement procedures. Duplication costs of the final compiled report will be administered by DNR.

D. SCHEDULES

Each agency will be responsible for arranging their own logistics, including transport, housing, and food. Such logistical arrangement may be integrated with other projects or with other agencies.

May 15, 1994	A written explanation goes to eleven oil spill communities that the compilation of information about local preservation attempts and concerns. A letter will be included which requests a meeting with local concerned people to survey their wants and needs.
June 1, 1994	Fieldwork on restoration projects will commence.
July 15, 1994	Contractual arrangements to process radiocarbon samples will be established.
October 15, 1994	Draft reports of fieldwork results will be completed. Draft plans for coordinated resource protection programs in the spill area will be available for local public comment.
March 1, 1995	Final field reports by agencies will be submitted to DNR for compilation into final report.

May 31, 1995 Final report to Trustees submitted for Project 94007.

E. EXISTING AGENCY PROGRAM

The Alaska Department of Natural Resources does not have an on-going field program dedicated to archaeological site location discovery in the oil spill area. No other ADNR field archaeology activities in the spill area exist other than on a specific, short term project basis for other agencies. The National Park Service does have a program aimed at characterizing site location criteria along the Gulf of Alaska coast but the program does not attempt site monitoring or intensive excavation. The U.S. Forest Service has a very small and intermittent effort at satisfying agency responsibility for specific project impacts on sites but no program of systematic site monitoring or investigation. The U.S. Fish and Wildlife Service has a similar presence in the Kodiak area but on an even more intermittent basis.

F. ENVIRONMENTAL COMPLIANCE/PERMIT/COORDINATION STATUS

The National Park Service (NPS) has taken the lead role in preparing an environmental assessment which evaluated the site speicific archaeolgocial restoration proposal for the 1993 work phase. The work proposed for 1994 is identical in nature and less extensive. The NPS determined that the proposed action will benefit natural and cultural resources with a minimum potential for adverse effect as documented by the environmental assessment. The restoration activities, which seek to repair archaeological sites injured by the Exxon Valdez Oil Spill, will provide for the salvage of archaeological artifacts and information from these sites and will aid the restoration of soils and vegetation on disturbed archaeological sites. U.S. Forest Service regulations dictate that a detailed environmental analysis be prepared by that agency for its activities and is on file in Forest Service records.

The proposed project is subject to the provisions of the National Historic Preservation Act, the Archaoelogical Resources Protection Act, and the Native American Graves and Repatriation Act. The project will be carried out in conformance with the consultative processes and standards demanded by these legislative mandates. Coordination between project agencies, and consultation and/or coordination with Native village and regional organizations will be accomplished as necessary.

The proposed action complies with the Endangered Species Act, the Marine Mammals Protection Act, and Executive Orders 11988 and 11990.

There will be no restriction of susbistence activities as documented by the Alaska National Interest Lands Conservation Act, Title VIII, Section 810(a) Summary of Evaluation and Findings.

G. PERFORMANCE MONITORING

Meeting project deadlines and objectives by the individual agencies as outlined in the schedule section will be the measure of performance for this project. Normal agency chain-of-command will insure compliance with project goals in the allotted time and continuity in the event of personnel

changes.

H. COORDINATION OF INTEGRATED RESEARCH EFFORT

The intent of the preservation program study phase of the project is to document the various programs in the spill area and allow coordination. The State of Alaska has no on-going archaeological research or inventory project in the oil spill area. The National Park Service has an on-going program site inventory effort intended to characterize site environments but which does not address site specific injuries. The U.S. Fish and Wildlife Service and the U.S. Forest Service have minimal programs dealing with effect of normal agency activities on sites but which are not related to the sites being restored.

I. PUBLIC PROCESS

The public in local communities will be involved in project process during consultation for the preservation program coordination study phase. The public will have an opportunity for involvement in the information gathering phase and at the draft review phase. Site specific restoration phase activities are subject to site location restrictions under requirements of ARPA and State policy (DPOR Policy 50200).

J. PERSONNEL QUALIFICATIONS

See attached resumes for key project personnel.

K. BUDGET

See attached detailed project budget forms 2A and 3A.

Judith E. Bittner

Office of History and Archaeology Department of Natural Resources P.O. Box 107001 Anchorage, Alaska 99510-7001 Office Phone: (907) 762-2622 Office Fax: (907) 762-2628

Education

1973	M.S., Anthropology, ABD, University of Wisconsin, Madison
1969	B.A., Anthropology, with Honors, University of Arizona

Work Experience

1984 - 94	State Historic Preservation Officer and Section Chief of the	Office
	of History and Archaeology	
1983-84	Historian, Division of Geological and Geophysical Surveys,	
	Department of Natural Resources	
1982-83	Director, Division of Parks, Department of Natural Resources	
1974-81	Instructor, part-time, Anchorage Community College and	
	University of Alaska. Anthropology, Native American courses.	
1976-77	Consultant, Cultural Relations	
1974-82	Administrative Manager, part-time, Chamer Company, Inc.,	

Commission Membership/Professional

National Conference of State Historic Preservation Officer Vice-President, 1994 Treasurer, 1992 to 1994 Board of Directors, 1990 to 1992 Chair, Advisory Council on Historic Preservation Committee National Trust for Historic Preservation Board of Advisors, 1989 to present Chair, Western Regional Advisors, 1991 to 1993 Member, Trustee's Property Committee, 1991 to present Administrative Committee, 1991 to 1993 Iditarod National Historic Trail Advisory Council, Dept. of Interior Member, 1982-1983; 1985 to present Historic Sites Advisory Committee Chair, 1984 to 1993 Alaska Historical Commission Ex-officio member, 1984 to present



Alaska Historic Records Advisory Board Member, 1984 to present Chair, 1993 to present Alaska Association for Historic Preservation Board of Directors, 1983 to present Anchorage Historic Properties, Inc. Board of Directors and Secretary, 1986 to 1991 Alaska Historical Society

Board of Directors, 1984 to 1987

Museums Alaska, Inc.,

Board of Directors, 1983 to 1986; Vice President, 1984 to 1986 Historic Anchorage, Inc.

Board of Directors and Treasurer, 1982 to 1985 Anchorage Historical and Fine Arts Commission Commission member, 1981 to 1988

Douglas R. Reger

Archaeologist II Office of History and Archaeology Alaska Division of Parks and Outdoor Recreation P.O. Box 107001 Anchorage, AK 99510-7001

Education

1981	PhD Anthropology, Washington State University
1973	M.A., Anthropology, Washington State University
1970	B.A., Anthropology, University of Alaska

Professional Experience:

1964	Field and museum assistant, U. of Alaska, Fairbanks
1965	Field assistant, U. of Alaska, Fairbanks -
1966	Field assistant, Alaska Methodist U.
1966-67	Laboratory/research assistant, Alaska Methodist U.
1969	Short field surveys, Cordova and Katmai, AK
1970	Field School Instructor, Alaska Methodist U., Tangle Lakes
1970-71	Excavated site 49KEN-029, near Kenai, AK
1971	Salvage archaeologist, Alyeska Pipeline Project
1971-74	Teaching assistant, Washington State U.
1972	Assistant Highways archaeologist, Washington State U.
1973	Project Archaeologist, Homer Society for Natural History
1974-75	Regional archaeologist, USDA Forest Service, Alaska Region
1975-82	Alaska State Archaeologist, Alaska Division of Parks
1978-82	Deputy State Historic Preservation Officer, Alaska
1982-86	Archaeologist, Alaska Division of Geological and Geophysical
	Surveys
1986-94	Archaeologist, Office of History and Archaeology, Alaska Division
	of Parks and Outdoor Recreation

Publications/Reports

- An archaeological survey in the Utopia area, Alaska, 1972 Anthropological Papers of the University of Alaska, 15(2), with **Richard D. Reger**
- Prehistory of the northern Kenai Peninsula, IN Prehistory of the North 1974 American Subarctic: the Athapaskan Question, edited by J.W. Helmer, S. VanDyke, and F.J. Kense, U. of Calgary, p. 16-21
- An Eskimo Site near Kenai, Alaska, Anthropological Papers of the 1977 University of Alaska, 18(2): 37-52





1983 Norton: a changing southeastern boundary. Arctic Anthropology 19(2): 93-99, with Joan B. Townsend
1987 Archaoelogy of a late prehistoric subsistence locality, the Clam Gulch Site (49KEN-045). Anthropological Papers of the University of Alaska 21: 89-103
1992 Effect of crude oil contamination on some archaeological sites in the Gulf of Alaska, 1991 investigations. Office of History and Archaeology Report No. 30, Alaska Division of Parks and Outdoor Recreation, p. 1-138, with J. David McMahan and Charles E. Holmes

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Professional Affiliations

Society for American Archaeology, Alaska Anthropological Association

Terje (Ted) G. Birkedal

Chief, Division of Cultural Resources National Park Service, Alaska Region 2525 Gambell Street Anchorage, AK 99503 (907) 257-2668

Education

1976	Ph.D, Anthropology, University of Colorado
1970	M.A., Anthropology, University of Colorado
1968	B.A. cum laude, Anthropology, University of Colorado

Field Experience

1965-1992: Survey and excavation experience includes Western Slope or Rockies, Colorado; High Grass Plains, Colorado; Colorado Plateau Area of American Southwest (Colorado, Utah, Arizona, and New Mexico); Rio Grande Valley, NewMexico; Delta Area, Louisiana; Southwestern Norway; Bella Bella Region of Canadian Northwest Coast; Guam (Micronesia); and various locations in National Parks of Alaska. Includes both prehistoric and historic archaeological experience.

Professional Job Experience

- 1971-1975 Instructor, Department of Anthropology, University of Guam
- 1976-1982 Archaeologist and later Branch Chief, Branch of Indian Archaeological Assistance, Southwest Region, National Park Service, Santa Fe Region, National Park Service, Santa Fe
- 1982-1985 Chief, Branch of Archaeological Resource Management, Southwwest Region, National Park Service, Santa Fe
- 1986-1992 Regional Archaeologist, Alaska Region, National Park Service, Anchorage
- 1992-1994 Chief, Division of Cultural Resources, Alaska Region, National Park Service, Anchorage

Professional Affiliations

Society for American Archaeology: Alaska Anthropological Association; National Trust for Historic Places; Sigma xi; Scientific Honorary Society

Charles E. Diters

Regional Archaeologist/Regional Historic Preservation Officer Alaska Region U.S. Fish and Wildlife Service 1011 E. Tudor Road Anchorage, AK 99503 (907) 786-3386

Education

1977 AM, Anthropology, Brown University 1971 A.B., Anthropology, Dartmouth College

Field Experience

- 1970 Excavation, Healy Lake Village Site, Alaska (University of Alaska)
 1970 Survey, Alyeska Pipeline route, Hogan Hill to Black Rapids (University of Alaska)
 1971 Excavation, Aniganigaruk and Mosquito Lake Sites, Atigun Canyon, Alaska (University of Alaska)
- 1977 Survey, National Petroleum Reserve, Alaska (National Park Service)
- 1978 Survey, National Petroleum Reserve, Alaska (National Park Service)

1978 Excavation, Russian Bishop's House, Sitka National Historic Park, Alaska (National Park Service)

- 1980-82 Surveys and project clearnaces, Chugach National Forest, Alaska
- 1982-94 Surveys and project clearances, National Wildlife Refuges throughout Alaska

Professional Affiliations

Society for American Archaeology; Alaska Anthropological Association; Arctic Institute of North America

John L. Mattson

Forest Archaeologist U.S.D.A. Forest Service Chugach National Forest 3301 "C" Street, Suite 300 Anchorage, AK 99503-3998 (907) 271-2513

Education

1985	PhD., Anthropology, University of North Carolina at Chapel Hill
1962	B.A., Anthropology, University of Washington

Papers and Publications

Numerous papers, reports and articles

Field Experience

Pacific Northwest, Southeast, Alaska

Linda Finn Yarborough

Assistant Forest Archaeologist U.S.D.A. Forest Service Chugach National Forest 3301 *C* Street, Suite 300 Anchorage, AK 99503-3998 (907) 271-2511

Education

Currently	PhD Student, Anthropology, University of Wisconsin, Madison
1974	M.A., Anthropology, University of Toronto
1973	B.A., Anthropology, State University of New York

Papers and Publications

Numerous papers, reports and articles

Field Experience

Archaeological Survey, testing, and excavations throughout many regions of Alaska

Project Budget Forms

EXXON VALDEZ TRUSTEE COUNCIL

1994 Federal Fiscal Year Project Budget October 1, 1993 - September 30, 1994

Project Description: Site Specific Archeological Restoration will utilize full on-site examination and treatment to ameliorate injury to archeological sites that were impacted by oiling, oil spill cleanup, and vandalism as a direct result of the Exxon Valdez Oil Spill. The budget shown here is the amount needed to complete work started in FFY 93 and includes field work, data analysis and report writing. Spill area communities will be visited to define and coordinate site protection strategies. The needs of local programs will be combined to develop a spill area plan to protect cultural resources.

Budget Category:	1993 Project No.	'93 Report/	Remaining			
	93006	'94 Interim'	Cost**	Total		
	Authorized FFY 93	FFY 94	FFY 94	FFY 94	FFY 95	Comment
Pareiwinal	\$83.8	561.5	\$197.0	\$258.5	\$132.7	Funding for preparation of light renor
Tened	\$33.8	\$1.0	\$24.4	\$25.4	\$50.5	of FEY 94 work is combined in FEY 96
Contraction	\$108.2	\$100.7	\$142.1	\$742.8	\$112.6	estimate with FFY 95 field work burding
Concentitie	\$7.1	\$1.3	\$20.8	\$272.0	\$13.8	
Equiqueet	\$7.1	\$0.0	\$8.7	\$8.7	so o	
Capital Outlay	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	× *
Solvetal	\$240.0	\$164.5	\$393.0	\$557.5	\$309.6	
Access Administration	\$20.1	\$16.3	\$39.5	\$55.8	\$27.8	
Project Total	\$260 1	\$180.8	\$432.5	\$613.3	\$337.4	
Full-time Equivalents (FTE)	1.8	1.2	3.4	4.5	2.3	
	Dollar ar	nounts are sh	own in thous	ands of dollar	s.	
Budget Year Proposed Personne	l:	Reprt/Intrm	Reprt/Intrm	Remaining	Remaining	
Position Description		Months	Cost	Months	Cost	
See Individual 3A Form	is for					
Personnel Details						
					L	
				·		NEPA Cost: \$13.9
· · · · ·						*Oct 1, 1993 - Jan 31, 1994
	Personnel Total	0.0	\$0.0	0.0	\$0.0	**Feb 1, 1994 - Sep 30, 1994
12 [3 03	T				****	
	Proie	ct Number:	94007			EOBM 2A
	f 13 Proje	et Title: Si		Archanding	inal Postar	
1				- Company	ncar nostori	
	Agen Agen	icy: AK De	pt. or and	rai nesolirc	es	DETAIL



EXXON VALDEZ TRUSTEE COUNCIL

1994 Federal Fiscal Year Project Budget

October 1, 1993 - September 30, 1994

Project Description: Site Specific Archeological Restoration will utilize full on-site damage examination and treatment to ameliorate injury to archeological sites that were impacted by oiling, oil spill cleanup, and vandalism as a direct result of the Exxon Valdez Oil Spill. DNR will lead the effort with local groups to develop site protection programs and compile information into a coordinated plan of protection.

Budget Category:	1993 Project No.	93 Report/	Remaining	·····			
	93006	94 Interne*	Cost	lotal		_	
	Authorized FFY 93	FFY 94	FFY 94	FFY 94	<u>FFY 95</u>	Comment	
Personaei	\$49.2	\$41.0	\$125.1	\$166.1	\$105.0	Funding for preparation of linal report of	
Travel	\$8.5	\$1.0	\$9.7	\$10.7	\$35.0	FFY 94 work is combined in FFY 95 estimate	
Contractual	\$14.5	\$1.5	\$107.7	\$109.2	\$105.0	with FFY 95 field work funding. The amount	
Commodities	\$3.9	\$1.0	\$7.8	\$8.8	\$10.0	authorized for this project in FFY 93 (\$87.2)	
Equipment	\$2.9	\$0.0	\$2.9	\$2.9	\$0.0	included the costs of data analysis and report	
Capital Outlay	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	writing. Start of project was delayed due to -	
Subtota	\$79.0	\$44.5	\$253.2	\$297.7	\$255.0	Trustee Council budget process. As a result,	
General Administration	\$8.2	\$6.3	\$26.3	\$32.6	\$23.1	data analysis and report writing will be done	
Project Tota	\$87.2	\$60.8	\$279.5	\$330.3	\$278.1	after 9/30/93. In order to accurately reflect	
						this in the budget process, please note that	
Foll-time Equivalents (FTE	0.8	0.7	1.8	2.5	1.6	we are returning to the Trustees \$50.8 and	
	Dollar ar	nounts are shown in thousands of dollars.				requesting that same amount (\$50.8) for the	
Budget Year Proposed Personn	el:	Reprt/Intrm	Reprt/Intrm	Remaining	Remaining	report period of FFY 94. Therefore: 1) the	
Position Description		Months	Cost	Months	Cost	monics expended to complete the FFY 93	
Ileger Archaeologist II		4.0	\$24.8	0.0	\$0.0	portion of this project is a reauthorization	
Archneologist I		2.5	\$13.0	0.0	\$0.0	and will not exceed the original FFY 93	
Project Manager		2.0	\$3.2	0.0	\$0.0	authorized amount; 2) the total amount	
						reflected for FFY 94 includes the amount	
Archaeologist II		0.0	\$0.0	12.0	\$73.2	(\$50.8) required to complete the FFY 93	
Archaeologist I		0.0	\$0.0	8.0	\$41.3	report portion of this project.	
Project Manager		0.0	\$0.0	, 1,5	\$10.6	NEPA Cost: \$0.0	
						*Oct 1, 1993 - Jan 31, 1994	
	Personnel Total	8.5	\$41.0	21.5	\$125.1	**Feb 1, 1994 - Sep 30, 1994	
117 (E 93	Proje	ct Number:	94007				
	Proie	ct Title Si	e Specific	Archaeologi	ical Restora	tion out	
1001 Page 2 c	of 13 Cub	Srainati	to operation		WALL CONTRACTOR	SUB-	
1334		nogeon –		, ,		PROJECT	
Promod 3/9:94	9.30 AM Agen	cy: AK De	pt. of Natur	al Resource	95	DETAIL	

EXXON VALDEZ TRUSTEE COUNCIL

1994 Federal Fiscal Year Project Budgut October 1, 1993 - September 30, 1994

Travel:				Reprt/Intrm	Remaining		
Report Travel to	o Fairbanks Museum (1 trip - 1	\$450 air tare + 5 5 days per diem @ \$95/day)		\$1.0	\$0.0		
Field tra Lars (12	Field travel, transportation to Kodiak, Homer, Seward, Prince William Sound communities, Port Graham, English Bay, Larsen Bay, and Karluk (12 trins - \$380 air fare + 4.5 days per diem @ \$95/day)						
					2		
			Travel Total	\$1.0	\$9.7		
Contractual:				80.0			
Bowyt f	COUSHIQ Neddoordoor			\$0.3 \$0.2	900 ¢2 K		
Renatia	inn - returial of human consi	us to consily with Federal Law INAGPRA (43 CER Part 10)		\$1.0	\$2.5		
Curation	contract with artifact reposit	ories for controlled curation (36 CFR 79)		\$0.0	\$68.3		
Sedimen	a sample processing - 114 sec	diment samples @ \$75/sample		\$0.0	\$8.5		
Radio ca	abon samples processing - 20	samples @ \$265/sample		\$0.0	\$5.3		
Air chart	er, fixed wing (8 hours @ \$5)	00/hour, 18 hours @ \$250/hour}		\$0.0	\$8.5		
Helicopti	er charter (4 hours @ \$900/h/	our)		\$0.0	\$3.6		
Boat Cha	arter			\$0.0	\$4.5		
Film Dev	eloping			\$0.0	\$2.5		
Report D	appeation	i.		\$0.0	\$1,5		
			Contractual Total	\$1.5	\$107.7		
97.14.93	***************************************	Project Number: 94007		1			
[]		Deploce Titles, Class Constitute Andreas to share Deploy		F(DRM 3B		
4 000	Page 3 of 13	rivject rille: Site Specific Archaeological Restoration	}		SUB		
		Sub-Project:			DJECT		
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1994 Federal Fiscal Year Project Budget

October 1, 1993 - September 30, 1994

Commoanie	est in the second s			Reprt/Intrm	Remaining
Reper Office	supplies (toner cartridges, papi	er, artifact stabilization supplies, archival packaging, binders, etc.)		\$1.0	\$1.0
Field s du reț	supplies (Rite-in-Rain notebooks ist pans, tin foil, water purificat placement mustang suits)	, Chem Wipes, photo chemicals, munsell color charts, film, shovels, ion pump, zodiac repair supplies, first-aid kits, video tapes,		\$0.0	\$6.8
		ι. ·	e e		
		c	ommodities Total	\$1.0	\$7.8
Equipment:					
Field E	quipment (first aid kits, shovels	s, etc.)		\$0.0	\$2.8
		¢.			
		v			
			Equipment Total	\$0.0	\$2.9
1994	Page 4 of 13	Project Number: 94007 Project Title: Site Specific Archaeological Restoration Sub-Project: Agency: AK Dept. of Natural Resources		FC	DRM 3B SUB- ROJECT

1994 Federal Fiscal Year Project Budget

October 1, 1993 - September 30, 1994

Project Description: Site Specific Archeological Restoration will utilize full on-site examination and treatment to ameliorate injury to archeological sites that were impacted by oiling, oil spill cleanup, and vandalism as a direct result of the Exxon Valdez Oil Spill. This is a continuation of a project started in 1993. Additional previously identified injured sites will be restored.

Budget Category:		1993 Project No.	'93 Report/	Remaining			
		93006	'94 Interim*	Cost**	Total		
		Authorized FFY 93	FFY 94	FFY 94	FFY 94	FFY 95	Comment
Personnel		\$10.6	\$2.1	\$54.3	\$56.2	\$14.9	"Interim funds are for completion
Travel		\$7.2	\$0.0	\$2.0	\$2.0	\$7.5	of a contract with Chugach Alaska Corp. to
Contractual		\$5.3	\$22.5	\$32.1	\$54.6	\$5.3	work on a 14(h)(1) site.
Commodities		\$1.0	\$0.0	\$10.8	\$10.8	\$1.9	These funds will complete a project started
Equipment		\$1.2	\$0.0	\$5.8	\$5.8	\$0.0	in 1993 but not completed because CAC
Capital Ordiay		\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	did not have 8(a) contracting authority.
	Subtotal	\$25.3	\$24.6	\$104.8	\$129.4	\$29.6	
General Adminis	tration	\$2.0	\$1.9	\$10.4	\$12.3	\$2.6	
Pro	ject Total	\$27.3	\$26.5	\$115.2	\$141.7	\$32.2	
Full-time Equival	ents (FTE)	0.3	0.0	1.3	1.3	Q.4	
		Dollar ar	nounts are sh	own in thous	ands of dollar	<u>s.</u>	
Budget Year Proposed Personnel:		Reprt/Intrm	Reprt/Intrm	Remaining	Remaining		
Position Descript	tian		Months	Cost	Months	Cost	
Hopet Archaeologist GS	5 11		0.5	\$2.1	0.8	\$5.0	
Engineering Tech	n. GS 4/5		0.0	\$0.0	1.0	\$2.5	
Program Manage	3		· 0:0-	\$0,0	0.6	\$2.8	
Surveyor			0.0	\$0.0	0.2	\$1.4	
Archaeological T	ech, GS 5		0.0	\$0.0	2.0	1 \$4.4	
Archaeological T	ech. GS 7		0.0	\$0.0	2.5	\$5.5	
Archaeological T	ech GS 9		0.0	\$0.0	- 2.5	\$7.3	NEPA Cost: \$13.9
Archaeologist GS	5 11		0.0	\$0.0	6.0	\$25.2	*Oct 1, 1993 - Jan 31, 1994
		Personnel Total	0.5	\$2.1	15.6	\$54.1	**Feb 1, 1994 - Sep 30, 1994
B71150		ct Nimbar	94007				
		n roje Davis			х х х		FORM 3A
Paor	a 5 of	13 Proje	cunne: Si	le specific	Archaeolog	ical Hestora	SUB-
		Sub-1	Project:				DJEC1
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1994 Federal Fiscal Year Project Budget October 1, 1993 - September 30, 1994

Travel:			Reprt/l	ntrm P	lemaining
Anch	orage to Chenega and Tatitlek (2	2 trips - \$300 bit fare/trip + 2 days per diem/trip @ \$150/day)	\$	0.0	\$1.2
Anch	orage to Cordova (1 trip - \$200	air fare/trip = 4 days per diem/trip @ \$150/day)	\$	0.0	\$0.8
		· · ·			
		Tra	vel Total \$	0.0	\$2.0
Contractual	b Ar for Conventing Officer Reproc	mototive to visit conteration sites (A trips & \$600000)		9.0	5 13 13
Contr.	act with Chugach Alaska Corp. t	to perform restoration work on 14 (h) (1) site	\$2	0.5	\$0.0
	v i				
Air ch	harter @ \$250/hour, 15 hours.		\$	0.0	\$3.8 \$3.8
Soil, r	coarter - o days @ \$1,200/day hetrographic, macrobotanical, po	ilen, phytolith, entomological & radio carbon analysis	\$	0.0	\$7.2 \$16.0
Geolo	gist contract - 10 days @ \$480/	/daγ	\$	0.0	\$4.8
Film d	levelopment		\$	0.0	¢0-3
		4	5		
		·	WAY COMMAN		
		Contractu	ial Total \$2	2.5	\$32.1
ar::[4:23]	nng	Project Number: 94007		FOR	M 38
		Project Title: Site Specific Archaeological Restoration		SI	UB
1994	Page b of 13	Sub-Project:	· · · · · · · · · · · · · · · · · · ·	PRO	JECT
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1994 Federal Fiscal Year Project Budget October 1, 1993 - September 30, 1994

Commoditie	5;			Reprt/Intrm	Remaining
Supl fo	e shall not			\$0.0	
Field a	ear such as snull nacks tams	field notehnois, sample hads etc.		\$0.0 \$0.0	\$1.0
Labora	tory supplies, chemicals	nala metanologi ataripita angat ana.		\$0.0	\$0.5
Field f	ood for six people for six weeks	;		\$0.0	\$2.5
Scalus	, plant press, flotation equipme	ent.		\$0.0	\$0 B
Float c	pats, field equipment (stove, pl	t tester, high intensity lights, tool kit)		\$0.0	\$6.0
* * *					
		· ,			
			11		
			Commodities Total	\$0.0	\$10.8
Equipment:					
Two si	olgens			\$0.0	\$0.8
Macint	osh computer and specialized s	oftware for laboratory analysis work		\$00	\$5.0
					ý
		i			
					:
			· · · · · · · · · · · · · · · · · · ·		4 m m
07:11:03		F	Equipment Lotal	<u>\$0.0 </u>	\$5.8
·····	١	Project Number: 94007		FC	ORM 3B
	Page 7 of 10	Project Title: Site Specific Archaeological Restoration			SUB-
1224	rage / or 13	Sub-Project:			hierra
		Agency: Dept. of Agenciture, Forest Service			NOT AN
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EXXON VALDEZ TRUSTEE COUNCIL 1994 Federal Fiscal Year Project Budget

October 1, 1993 - September 30, 1994

Project Description: Funds requested in FFY 94 are write-up the results of restoration work conducted in FFY 93 on five injured archeological sites located on lands managed by the Fish and Wildlife Service

Budget Category:	1993 Project No.	'93 Report/	Remaining	Tatal		
5 / 1 / 2 / 2 / 2 / 2 / 2 / 2 / 2 / 2 / 2	93000	94 Interna		10131	rey or	Constant
	Authorized FFY 93	FFY 94	<u>rrî 94</u>	FFY 94	FFY 55	Lonmen
Personnel	\$14.9	\$10.5	\$5.0	\$15.5	\$0.0	
Travel	\$10.4	\$0.0	\$2.5	\$2.5	\$0.0	
Contractual	\$3.5	\$0.0	\$0.0	\$0.0	\$0.0	
Commodities	\$1.2	\$0.0	\$0.0	\$0.0	\$0.0	
Equipment	\$1.8	\$0.0	\$0.0	\$0.0	\$0.0	;
Capital Outlay	\$0.0	\$0.0	\$0.0	\$0.0	\$0,0	
Subtotal	\$31.8	\$10.5	\$7.5	\$18.0	\$0,0	
General Administration	\$2.6	\$1.6	\$0.8	\$2.3	\$0,0	
Project Total	\$34.4	\$12.1	\$8.3	\$20.3	\$0.0	
Full-time Equivalents (FTE)	0.4	0.3	0.1	0.3	0.0	
	Dollar an	nounts are sh	own in thous	ands of dollars	S.	
Budget Year Proposed Personne	1:	Reprt/Intrm	Reprt/Intrm	Remaining	Remaining	
Position Description		Months	Cost	Months	Cost	
Repri Archeologist, GS-12		1.0	\$5.0	0.8	\$5.0	
Archeologist, GS-09		2.0	\$5.5	0.0	\$0.0	
					,	
				,		NEPA Cost: \$0.0
						*Oct 1, 1993 - Jan 31, 1994
	Personnel Total	3.0	\$10.5	0.8	\$5.0	**Feb 1, 1994 - Sep 30, 1994
117714793	Proie	ct Number:	94007			EODA 2A
	Proie	ct Titles Sit	e Specific	Archaeologi	inal Restore	tion cum
ADDA Page 8 0	f 13	Sub-Project:				SUB-
1334	Jond-1					PROJECT
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1994 Federal Fiscal Year Project Budget October 1, 1993 - September 30, 1994

Ancherage to Kodak commonities (4 trips - \$325 air fare/trip + 2 days per diem/trip @ \$150/day) Travel Total \$0.0 \$2.1 Travel Total \$0.0 \$2.1 Contractual Total \$0.0 \$2.1 Page 9 of 13 Project Number: 94007 Project Tuber: Site Specific Archaeological Restoration Sub Project:	Travel:						Reprt/Intrm	Remaining
Travel Total SO.0 \$2.5 Contractual Total SO.0 \$2.5 Contractual Total SO.0 \$2.5 Contractual Total SO.0 \$0.0 Project Number: 94007 Project Number: 94007 Project Tube: Site Specific Archaeological Restoration Sub Project:	Anchorage	to Kodiak communities	(4 trips - \$325 nir fare/trip	+ 2 days per diem/trip	@ \$150/day}		\$0.0	\$2.5
Travel Total 50.0 \$2.5								
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Agency: Dept. of Interior, Fish & Wildlife Service		B	Agency: Dept. of	f Interior, Fish & Wild	llife Service	a sa		NOLUT -



1994 Federal Fiscal Year Project Budget

October 1, 1993 - September 30, 1994

Commodities		Reprt/Intrm	Remaining
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	Commodifies Tota	\$0.0	\$0.0
Equipment:			
	Equipment Total	\$0.0	\$0,0
07(1907)	Project Number: 94007	FC	DRM 3B
100/	Page 10 of 13 Project Litle: Site Specific Archaeological Restoration		SUB-
1334	Agency: Dept. of Interior. Fish & Wildlife Service	PF	IOJECT
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1994 Federal Fiscal Year Project Budget

October 1, 1993 - September 30, 1994

Project Description: Site Specific Archeological Restoration - This project includes completion of special analyses, curation and report writing for FFY 93 field work on behalf of all participating agencies. FFY 94 work includes oil-effects monitoring at SEL-188 (Kenai Fjords) and follow-up mapping, oil effects monitoring and final restoration treatment at AFG 043, XMK-058, and XMK-030 (Katmai).

Budget Category:	1993 Project No.	'93 Report/	Remaining	·•••		
	93006	94 Interim*	Lost	l lotal		
	Authorized FFY 93	FFY 94	FFY 94	<u>++Y 94</u>	FFY 95	Comment
Personael	\$9.1	\$7.9	\$12.8	\$20.7	\$12.8	
Travel	\$7.7	\$0.0	\$10.2	\$10.2	\$8.0	The amount authorized for the National Park
Contractual	\$84.9	\$76.7	\$2.3	\$79.0	\$2.3	Service (NPS) portion of this project in FFY
Commodities	\$1.0	\$0.3	\$2.2	\$2.5	\$1.9	93 (\$111.2) included \$76.1 for oil sample
Едиртен	\$1.2	\$0.0	\$0.0	\$0.0	\$0.0	analysis and duration contracts. Funds for
Capital Outlay	\$0.0	\$0.0	\$Q.Q	\$0.0	\$0.0	these contracts were received too late
Subtotal	\$103.9	\$84.9	\$27.5	\$112.4	\$25.0	by NPS to complete the contracting process.
General Administration	\$7.3	\$6.6	\$2.1	\$8.6	\$2.1	Therefore, NPS will not be spending the \$76.
Project Total	\$111.2	\$91.5	\$29.6	\$121.0	\$27.1	in FFY 93. NPS is requesting authorization to
						spend the \$76.1 in FFY 94. If approved NPS
Full time Equivalents (FTE)	0.2	0.2	0.2	0.4	0.3	will use the \$76.1 from FFY 93 as a credit
	Dollar an	nounts are sh	own in thous	ands of dollar	S.	against a future Court request.
Budget Year Proposed Personne	J:	Rept1/Intrm	Reprt/Intrm	Remaining	Remaining	· · · · · · · · · · · · · · · · · · ·
Position Description		Months	Cast	Months	Cost	
Repair Supervisory Archeologist,	GS-13[4]	0.5	\$3.1	0.0	\$0.0	
Archeologist, GS 11[2]		0.5	\$2.0	0.0	\$0.0	
Archeologist, GS-09[1]		. 1.0	\$2.8	0.0	\$0.0	
Archaeologist GS 11		0.0	\$0.0	2.5	\$12.8	
				۰ ۶		NEPA Cost: \$0.0
						*Oct 1, 1993 - Jan 31, 1994
	Personnel Total	2.0	\$7.9	2.5	\$12.8	**Feb 1, 1994 - Sep 30, 1994
07 (4.9)	Proja	ot Number	94007			
Page 11	of 13 Sub-I	ct Title: Sil Project:	te Specific	Archaeolog	ical Restore	ation
Prested: 3.9-94	9:30 AM Agen	cy: Dept. (of Interior, I	National Pa	rk Service	DETAIL

1994 Federal Fiscal Year Project Budget

October 1, 1993 - September 30, 1994

Travel:			Reprt/Intrm	Remaining
Anc	horage - Kenai Fjords (3 trips - \$43	30 air fare/top + 2 days per diem/trip @ \$160/day)	\$0.0	\$2.3
Anc	horage - Katmai Coast (3 trips - \$9	10 air fare/trip + 4 days per diem/trip @ \$130/day + 6 days per diem/trip @ \$19/d	\$0.0	\$4.6
King	3 Salmon - Anchorage (1 trip - \$45)	0 air fare/trip + 2 days per diem/trip @ \$160/day)	\$0.0	\$0.8
Anc	horage - Prince William Sound Con	munities (4 trips - \$325 air fare/trip + 2 days per diem/trip @ \$150/day)	\$0.0	\$2.5
		Iravel Total	\$0.0	\$10.2
Contractu			20.2	8 : X : X
Phot Phot	a reproduction for report illustration		90.2 60 A	0.0¢ \$0.0
Sam	ple processing (analysis cost for oil	A samples taken by all participating agencies in 1993.	\$7.8	\$0.0
1	Eleven CGMS samples x \$710/sam	iple)		
Cora	ition - This is a one-time cost for ca	ataloging, care and long term storage for all field records and specimens	\$68.3	\$0.0
1	collected by all participating agenci	es in 1993. This estimate is based on curatorial costs resulting from		
6	Federal standards (36 CFR Part 79)	for approximately 1,000 items.		
Нера	itriation to appropriate native group	os of human remains, grave goods, and cultural patrimony in accordance	\$0.0	\$1.5
\	with the Native American Graves P	TOTOCHOR THE REPARTATION ACT (NAGPHA) WHICH INCLUDES CONSULTATION WITH		
e Film	mars, renarar costs, simpling, en mocessing	.,	snn	\$0.4
Repo	production	•	\$0.0	\$0.4
and an international second		Contractual Total	\$76.7	\$2.3
977 14 793		Project Number: 94007	FC	BM 38
		Project Title: Site Specific Archaeological Restoration		SLIR.
1994	Page 12 of 13	Sub Project:	Da l	OFCT
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1994 Federal Fiscal Year Project Budget October 1, 1993 - September 30, 1994

Commo	odities:	Reprt/Intrm	Remaining
Begat D	rafting supplies (paper, mylar, etc.) for maps and illustrations for report production	\$0.3	\$0.0
Fi	eld supplies (first aid kits, shovels, etc.)	\$0.0	\$1.0
0	ffice supplies (paper, film, etc.)	\$0.0	\$1.2
	Commodities Total	\$0.3	\$2.2
Equipm	ent:		
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ota cos	Equipment Total	\$0.0	\$0.0
1997 - F. 41 (1912	Project Number: 94007	FC	DRM 3B
10	Project Litle: Site Specific Archaeological Restoration		SUB
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APPENDIX 1: Detailed Agency Work Plans

ARCHAEOLOGICAL SITE SPECIFIC WORKPLAN, 1994 DEPARTMENT OF NATURAL RESOURCES Office of History and Archaeology

Project Manager: Judith E. Bittner Project Leader: Douglas R. Reger

The site specific restoration project (94007) activities planned by the Office of History and Archaeology, Alaska Department of Natural Resources, during 1994 include two main efforts. The first is continuation of the field documentation and monitoring begun in 1993. The second part will be compilation of data about various cultural heritage preservation programs in the spill area and devising a plan for coordinated approaches for the future. The primary objective of the second activity will be to protect damaged sites and related collections.

Staff of the Office of History and Archaeology visited sites on Nuka Island, in Port Dick, and on Shuyak Island during 1993 to document damage to sites in a fashion where future monitoring of the sites will be standardized and simplified. A draft preliminary report of OHA activities for 1993 has been submitted to the lead agency, NPS, for inclusion in the 1993 fieldwork report, Site maps were prepared at SEL-178, SEL-215, SEL-220, AFG-046, and AFG-081 and photograph reference points established. SEW-440 was to be visited during 1993 but was not due to lack of suitable field time and to weather problems.

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Planned work during 1994 will involve returning to sites mapped during 1993 to relocate site datum and photograph points and to document any changes which have taken place. Features, artifacts, and other data recorded during 1993 will be re-located and any new evidence of vandalism documented. Photographs from 1993 which document 1993 conditions will be taken into the field to provide a comparison and insure site views are duplicated in 1994.

Sediment will be tested for presence of oil using a Hanby Field Testing Kit and if petroleum hydrocarbons are indicated, further samples will be collected for more sophisticated laboratory analysis. Sites where sediments will be investigated include AFG-098, AFG-046, SEL-178, SEL-215 and SEL-220. Additionally, a visit to SEW-440 will be coordinated with the U.S. Forest Service to sample beach sediments at that siteand document current status.

Restoration was attempted at AFG-081 during 1993 by filling the hole left by vandals with rocks, and gravel then covering with wood, sea weed and grasses to stabilize the surface and encourage revegetation. That fill will be examined to monitor effectiveness of the restoration attempt.

The Perevalnie Passage Site will be re-visited to monitor for vandalism damage and collect remains from the beach to preserve them from destruction. Human remains which were eroding out of the midden during

13

1993 will be collected with isolated skeletal parts noted in 1993 and the appropriate native group consulted for repatriation. A detailed plan for restoration will be developed for the site.

The second objective of Restoration Project 94007 is the compilation of information and requirements of various heritage site preservation programs in the spill area. The intent is to determine future needs for the protection from spill related damage and develop a coherent approach to preservation. A letter outlining the intent of the effort, its limits, and a request for consultation with local communities and interested groups will be sent to spill spill area groups in late spring or very early summer. Much of the impetus for the effort came from requests for construction of museums or similar facilities in various



Figure 2: Oil Spill area communities to be consulted during Heritage Preservation Plan phase of Restoration Project 94007.

communities of the spill area. Trustee staff and the Executive Director of the Council felt that a coherent, realistically attainable plan of protection for the area is needed. That is the objective of this part of the project. A representative from the Office of History and Archaeology accompanied by a



representative of the locally appropriate federal agency will meet with interested parties and record data about local facilities, programs and needs. A summary of findings and recommendations will be prepared for local review and comment by October 15, 1994. Comments received on the draft will be incorporated in a final report to the Trustees Council to be submitted by May 31, 1995.



Work Plan—Site Specific Archeological Restoration (Project 94-007) U.S. National Park Service (Phase II, 1994)

Agency Project Leader: Ted G. Birkedal

Background

Under the aegis of, and in conformance with, the general work plan for Site Specific Archeological Restoration, the U.S. National Park Service (NPS) has undertaken site specific archeological restoration at three archeological sites in 1993, and will complete appropriate site specific archeological restoration at the same three sites, Kaguyak Village site (AFG-043), the McArthur Pass site (SEL-188), and the Cape Gull Cove site (XMK-058) during the 1994 field season.

Two of the sites, AFG-043 and XMK-058, are located within Katmal National Park and Preserve. The third site, SEL-188, is located within Kenai Fjords National Park. To date, these three sites represent the only NPS sites that have been documented as injured and still require restoration action (Jesperson and Griffin 1992; McAllister n.d.), Specific restorative actions to be conducted at each site in 1994 are detailed below:

Cape Gull Cove Site (XMK-058)

XMK-058, which is located on the western shore of Shelikof Strait, consists of prehistoric midden, three house depressions, four small depression features, and a scatter of intertidal artifacts. The site was heavily olled during the Exxon Valdez spill incident, was subject to minor vandalism, and suffered further injury during the oil spill response activity. The restoration measures recommended include full field site damage assessment, physical restoration, and oil effect monitoring.

1. Injury Assessment

The existing site map (NPS 1993) will be used to continue documenting the site's present condition and show any new natural or human-caused disturbances or injuries, using the existing datums.

The site visit will be made at a time when the vegetation permits the current status of injury to be documented, including a measure of the extent of the injury. If significant physical restorations are necessary, an estimate of the area which will be subject to site restoration will be made.

Profile drawings, with soil and Munsell color descriptions, will be obtained from stratigraphic exposures.

Charcoal samples for radiocarbon dating will be collected, as appropriate.

Distribution of exposed artifacts will be recorded. Artifacts scattered on the



surface as a result of vandalism will be collected, cataloged, and curated using standard curation procedures.

Looter's holes and backdirt piles will be investigated. The extent and kind of investigation will be guided by standard ARPA procedures. Any artifacts located out of their primary context as a consequence of vandalism will be collected.

All tests and evidence collected, including sediment sampling, artifact collection, and so forth, will be provenienced in three dimensions in reference to the map datum, either by Cartesian coordinates or by azimuth, distance, and elevation. Details of methodology will be documented.

A full photographic record representing an update of the status of the site will be obtained. The photographic stations will be referenced to the site datum. Photo records will document roll number, film type, frame number, subject, direction of view, date and time, and photographer.

A determination of archeological value and cost of any additional restoration and repair will be made and a damage assessment report prepared.

2. Emergency Restoration

Restoration measures were not taken in 1993 due to a heavy vegetative mat that precluded any kind of damage assessment.

Restoration will include controlled recovery and analysis of any disturbed archeological resources and clearing off the face of any injury exposures and excavating small tests of adjacent deposits. Test excavations may be necessary to determine the full extent of the injury and to document the age and content of deposits. The permanent curation of any collected material will be provided as previously agreed upon, per 36 CFR 70. The repatriation and/or reinterment of any disturbed Native American human remains and related cultural items (per ARPA and NAGPRA) will also be provided for.

As necessary, looter or vandal excavations will be backfilled, the ground contour will be reconstructed, and the surface will be stabilized. In the instance where excavation is required, remove the vegetative mat carefully, in one piece, and replace it after backfilling. A ground cloth will be used to put backdirt on, to avoid long-term impacts to vegetation. The limits of the disturbed deposits will be marked, such as by lining the hole with perforated plastic sheeting.

Field work shall be conducted as early as possible in the summer so as to avoid having to deal with thick vegetation. Ideal dates will be from May 1 to June 1.

3. Oil Monitoring and Sample Collection

A full photographic record of the current status of the sample collection areas will be obtained, using established photographic stations referenced to the site datum. Photo records (which may include video as well as still photographs) will document roll number, film type, frame number, subject, direction of view, date and time, and photographer.

Monitoring the direct effect of oiling will be accomplished through controlled collection of sediment samples. Samples will be recovered from three locations within or immediately adjacent to the site boundary; one in the low intertidal, one in the mid intertidal, and one in the upper intertidal. The sampling locations will be permanently marked on the ground and plotted on the site map. If indicated, samples may be collected from above the high tide line.

Small sample units, each about 20cm square, will be excavated at each sample location. Two primary samples will be collected from each unit, one from approximately 10cm below the surface and one from approximately 10cm above the "sterile base." Similar duplicate samples will be collected. Any artifacts or other archeological material encountered in the sample units will be collected, analyzed, and curated.

Chemically cleaned 250ml sampling jars will be used to collect the sediment samples. The primary and duplicate samples will be collected using sterile tools. A label noting the sample number, date, time, location (including threepoint provenience), and collector will be affixed to each sample. Duplicate samples will be designated by the same sample number but with letter modifiers. The sample jars will be adequately sealed.

Analysis, for total recoverable petroleum hydrocarbons and for calcium, phosphate, and total organic carbon will be performed under contract.

Kaguyak Village Site (AFG-043)

AFG-043 is an historic (and possibly prehistoric) village site located on the Alaska Peninsula north of Cape Chiniak. The site consists of about 25 house depressions, 13 historic structures, a kashim, remains of a burned Russian Orthodox church, and a cemetery area. during 1989 and 1990, Exxon investigators documented recent vandalism on the site. The restoration measures which have been recommended include full injury assessment and physical restoration. NPS accomplished some restoration activities in 1993, and the following restoration activities will be carried out at this site in 1994:

1. Injury Assessment

The existing map of the site (NPS 1993) will be used as a basis to judge the site's present condition. Any new natural or human disturbances will be noted on the map.





The site visit will be made at a time when the vegetation permits the current status of injury to be documented, including a measure of the extent of the injury. If significant physical restorations are necessary, an estimate of the are which will be subject to site restoration will be made. Tests for oil contamination will be made in the intertidal area again in 1994, following standard procedures.

Profile drawings, with soil and Munsell color descriptions, will be obtained from stratigraphic exposures.

Charcoal samples for radiocarbon dating will be collected, as appropriate.

Distribution of exposed artifacts will be recorded. Artifacts scattered on the surface as a result of vandalism will be collected, cataloged, and curated using standard curation procedures.

Looter's holes and backdirt piles will be investigated. The extent and kind of investigation will be guided by standard ARPA procedures. Any artifacts located out of their primary context as a consequence of vandalism will be collected.

All tests and evidence collected, including sediment sampling, artifact collection, and so forth, will be provenienced in three dimensions in reference to the map datum, either by Cartesian coordinates or by azimuth, distance, and elevation. Details of methodology will be documented.

A full photographic record representing an update of the status of the site will be obtained. The photographic stations will be referenced to the site datum. Photo records will document roll number, film type, frame number, subject, direction of view, date and time, and photographer.

A determination of archeological value and cost of any additional restoration and repair will be made and a damage assessment report prepared.

2. Emergency Restoration

Restoration measures were not taken in 1993 due to a heavy vegetative mat that precluded any kind of damage assessment.

Restoration will include controlled recovery and analysis of any disturbed archeological resources and clearing off the face of any injury exposures and excavating small tests of adjacent deposits. Test excavations may be necessary to determine the full extent of the injury and to document the age and content of deposits. The permanent curation of any collected material will be provided as previously agreed upon, per 36 CFR 70. The repatriation and/or reinterment of any disturbed Native American human remains and related cultural items (per ARPA and NAGPRA) will also be provided for. As necessary, looter or vandal excavations will be backfilled, the ground contour will be reconstructed, and the surface will be stabilized. In the instance where excavation is required, remove the vegetative mat carefully, in one piece, and replace it after backfilling. A ground cloth will be used to put backdirt on, to avoid long-term impacts to vegetation. The limits of the disturbed deposits will be marked, such as by lining the hole with perforated plastic sheeting.

Field work shall be conducted as early as possible in the summer so as to avoid having to deal with thick vegetation. Ideal dates will be from May 1 to June 1.

McArthur Pass site (SEL-188)

The McArthur Pass site (SEL-188), located on the southern coast of Kenal Peninsula, consists of a remnant of prehistoric midden on a narrow wooded bench and a scatter of Intertidal artifacts. The site was originally identified and investigated during the 1989 *Exxon Valdez* oil spill and cleanup activities, and was further tested in 1990 and 1991 (Betts, et al. 1991; Dekin, et al. 1992). Radiocarbon dates ranging from 1710±120 BP to 560±50 BP have been obtained from the site. These dates and the few diagnostic artifacts recovered suggest that the site represents an occupation of Kachemak period (middle to late) affiliated peoples.

SEL-188 was heavily oiled during the *Exxon Valdez* spill incident and suffered further injury during the oil spill response activity. The site is one of 24 known archeological sites identified as still being in need of appropriate restoration activities (Jesperson and Griffin 1992; McAllister n.d.). The *Site Specific Archeological Restoration Project* (93-006) was approved by the *Exxon Valdez* Oil Spill Trustees, with the goal of ameliorating injury to archeological sites that were impacted by oiling, oil spill cleanup, or vandalism as a direct result of the *Exxon Valdez* oil spill event. General objectives of this restoration project included full injury assessment, emergency restoration, and establishment of monitoring controls and collection of samples (USNPS 1993).

As extensive work previously done at SEL-188 is considered to have accomplished other restoration measures (Betts, et al. 1991; Dekin, et al. 1992), the only restoration measure which was recommended was oil effect monitoring. During 1993, site documentation photographs were taken from a number of stations and sediment samples were collected for oil effects monitoring analysis (Klingler 1993). Sediment samples will again be collected in 1994.

Oil Monitoring and Sample Collection

A photographic record of the current status of the site will be obtained. Photographs will be taken from stations previously established. Photo records (which may include video as well as still photographs) will document roll number, film type, frame number, subject, direction of view, date and time, and photographer.



Monitoring the direct effect of oiling will be accomplish through controlled collection of sediment samples, using established protocol (USNPS 1993). As the 1993 collection effort demonstrated, the available sediments may be of insufficient depth to provide more than one sampling depth (Klingler 1993). Samples will be recovered from thre locations within or immediately adjacent to the site boundary: one in the low intertidal, one in the mid intertidal, and one in the upper intertidal. The sampling locations will be plotted on the site map. If indicated, samples may also be collected from above the tide-line. Any artifacts or other archeological material encountered in the sample units will be collected, analyzed, and curated.

Analysis, for total recoverable petroleum hydrocarbons and for calcium, phosphate, and total organic carbon will be performed under contract.

Field work, which will be integrated with ongoing NPS activities in the area, shall be conducted between June 1, 1994 and September 30, 1994.

Personnel

The key personnel involved in various phases of this project may include Ted Birkedal, Chief, Division of Cultural Resources, Alaska Region; Gary Somers, Regional Archeologist; NPS Archeologists Aron Crowell, Steve Klingler, and Karlene Leeper; and Pat McClenahan, Archeologist, Katmai National Park and Preserve.

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U.S. National Park Service

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Site Specific Archaeological Restoration and Cultural Resource Protection U.S. Fish and Wildlife Service Project 94007

Agency Project Leader: Charles E. Diters

Introduction

In 1993 archaeologists from the U.S. Fish and Wildlife Service (Service) visited five sites injured during the 1989 Exxon Valdez Oil Spill and subsequent cleanup. For four sites on Afognak Island the Service has responsibility only for the intertidal areas. The 1993 investigations showed no new impacts to these sites from either erosion or lilegal digging. The fifth site, KOD-171 on western Kodlak Island, continues to suffer from ongoing erosion and casual artifact hunting. In general, collectors concentrate on artifacts exposed by natural erosion. In some cases, however exposures in the bluffs show recent, small scale excavations. Persons involved in collecting and digging are probably from the immediate area. Numerous cabins and set net locations dot the shores of Chief Cove and Chief Island.

Plan for Restoration at KOD-171

Two agency archaeologists will revisit the site to document any additional damage. This will enable us o quantify the rate at which damage is occurring. Anynew damage will be documented according to the guidelines outline in the interagency detailed work plan. Sediment samples from the intertidal zone will not be collected, no sign of oiling was observed during the 1993 investigation. Until the root cause of the damage is corrected, specific restoration measures, such as revegetation, will not be undertaken as they would not be effective.

The only solution to ongoing problems of collecting at KOD-171 is increased monitoring of the site and public education. To address this long term need we will contact Chief Island residents and fishermen. Since it is likely the main agents of destruction are locally based, agency efforts to protect the site will fail without local cooperation and assistance. During the visit we will provide information on site protection and attempt to recruit Stewards to monitor site conditions. If we are successful in recruiting volunteers they will be provided with cameras and forms for reported findings.

Community/Agency Site Protection Planning

We will accompany representatives form the State Office of History and Archaeology to Karluk and Larsen Bay. Village meetings in these communities will provide information for proposals to develop community site protection plans.

A. Site Specific Archaeological Restoration, 94007 U.S.D.A. Forest Service

Agency Project Leader: Linda Finn Yarborough

B. Introduction

Current studies have indicated evidence for injury to 24 known sites which can be linked to the Exxon Valdez oil spill. The purpose of this project is to provide restorative treatment to two sites owned by the Chugach National Forest, based on recommendations by a multi-agency panel of experts in archaeology of the region, chaired by Martin McAllister (1992).

Both sites were discovered in 1989 during Shoreline Cleanup Assessment Team (SCAT) surveys. SEW-440 is on a tambolo west of a small headland in Northwest Bay. on Eleanor Island, while SEW-488 is on a similar feature on northeastern Knight Island. SEW-440 has both prehistoric and historic components in both intertidal zone (ITZ) and upland areas. SEW-448 appears to have a fairly early prehistoric component. within the context of the known cultural development of Prince William Sound, Injury to SEW-440 consists of severe oiling at the time of the spill, an increase in erosion of a the prehistoric midden component as a result of foot traffic and high pressure water treatment during the cleanup response, displacement of archaeological resources during geological testing, and an un-backfilled excavation in the horizontal surface of the site (Jesperson and Griffin 1992; McAllister 1992). Injury to SEW-488 consists of oiling during the time of the spill, and displacement of archaeological resources during high pressure water treatment and unmonitored cleanup activities (Jesperson and Griffin 1992; McAllister 1992). Erosion along three portions of the site was evident in 1991 (Dekin et al. 1993). The proposed project is designed to effect the restoration measures proposed by Martin McAllister (1992) for each of these sites. This includes a full field site damage assessment, and recovery, analysis, and curation of artifacts for both SEW-440 and SEW-488, with additional backfilling and surface stabilization at SEW-440. These sites have both been 'treated as being eligible for inclusion in the National Register" (Mobley et al. 1990:230), although no formal determination of eligibility has been made for either. The proposed work will be accomplished in accordance with the Archaeological Resources Protection Act (PL 96-95, 43 CFR 7), the Secretary of the Interior's Standards and Guidelines for Archaeology and Historic Presestvation, and standard archaeological practices. The planned work is based on a careful review of the results of earlier injury investigations. None of the planned work duplicates previous studies.

C. Project Description

Resources and/or Associated Services:

The resources to be restored through this project are two archaeological sites in Prince William Sound: SEW-440, on Eleanor Island, and SEW-488, on northeastern



Knight Island. Studies which have identified injury to these sites recommend restoration through damage assessment, archaeological recovery, analysis, and curation of artifacts, and, in the case of SEW-440, site stabilization.

Relation to Other Damage Assessment/Restoration Work:

This project is based on damage assessment studies by Jesperson and Griffin (1992), and, in the case of SEW-488, additional assessment work by a crew from SUNY Binghamton (Dekin *et al.* 1993).

Objectives:

The goal of the project is to ameliorate the damage to the sites by implementing the restoration measures proposed by McAllister (1992). In order to protect and preserve the remaining cultural deposits it will be necessary to understand the nature of each site, and the extent to which the identified damage has compromised or destroyed information contained in the sites.

Methods:

The restoration measures recommended by McAllister (1992:8-12) are guided by ARPA regulations, Section 14(c). The full field site damage assessment will include, for each site, documentation of its present condition through mapping and photography, documentation of the current status of injury, drawing profiles of stratigraphic exposures, and scientifically conducted test excavations. Artifacts recovered during the course of the assessment and test excavations will be analysed and curated at a Federally approved facility for materials from National Register eligible sites. All archaeological tests will be backfilled, as will the geologist's test at SEW-440, and the site surfaces will be stabilized.

Each site map will delineate topographic features, cultural features, the distribution of exposed artifacts, the locations of test excavations, the level of mean high tide, erosion exposures, and locations of injuries in relation to a permanent datum and a secondary reference point. Injured areas will be measured and tests well be performed in the intertidal area for buried cultural material and oil contamination. Stratigraphic profiles will be described in relation to soil and Munsel color descriptions, and cultural contents. Test excavations will be conducted in natural levels where possible, and in 5 cm levels where natural levels are not evident, or exceed 5 cm in depth. Excavated material will be screened through 1/8 inch screens, and bulk samples will be collected in a consistent manner to allow later analysis of macrobotanical, phytolith, pollen, and faunal data. Artifacts and features will be provenienced three-dimensionally in reference to the map datum. The photoaraphic record will include recordation from stations referenced to the site datum as well as a full photographic record of the test excavations, documenting the roll number, film type, frame number, subject, direction of view, date, and photoarapher.

The estimated surface size of SEW-440 is about 120 m², with an estimated depth of 50 to 90 cm. No assessment work has been done on this site. The proposed methodology is to excavate several 50 cm by 50 cm tests to locate the boundary of the site, and to excavate four 1x1 m tests in different areas of the site, including one test in the intertidal zone, to ascertain the cultural content of the site

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and, potentially, its significance. It is believed that this work will result in excavation of approximately 3% of the site.

Some assessment work was accomplished at SEW-488 in 1991 (Dekin *et al.* 1993). Shovel testing established the rough boundaries of the site, and the collection of a small amount of *in situ* material resulted in a tentative determination of site age and cultural affiliation. Soil samples were taken for the Hanby test for aromatic hydrocarbons and TRPH analysis. The restoration work which remains to be done includes location or re-establishment of the datum, and excavation of 1x1 m test units between 1991 Test Units 1 and 2 to establish the relationship between the two areas of the site represented by the tests, and the presence or absence and potential significance of the hypothesized extensive sequence of occupational layers interspersed by beach deposits. The site is estimated to be approximately 2940 m3 in size, and the proposed work is expected to result in excavation of about 1% of the site.

Location:

Both archaeological sites are in western central Prince William Sound, SEW-440 is on the northwest shore of Northwest Bay, on northern Eleanor Island, while SEW-488 is on the north east shore of Knight Island (see attached maps).

Technical Support:

The required technical support includes qualified field personnel, sample analyses, and permanent curation of collected material (per 36 CFR 79). The sample analyses are expected to include hydrocarbon, petrographic, soil, macro-botanical and wood, phytolith, pollen, entomological, and faunal analyses. Artifact and cultural analysis for each site will be accomplished using GIS layers and a Macintosh computer with appropriate software.

Contracts:

Contracts for boat charter, radiocarbon dating, botanical, faunal, and soil sample analysis, hydrocarbon analysis, reproduction of color graphics and photographs for publication, and permanent curation of collected material are necessary to provide technical support not available in house. Contracts will be administered by the Chugach National Forest using standard procedures.

Literature Cited:

Dekin, Albert A., Jr.; Mark S. Cassell, James I. Ebert, Eileen Camilli, Janet M. Kerley, Michael R. Yarborough, Peter A. Stahl, and Beth L. Turcy

1993 Exxon Valdez Oll Spill Archaeological Damage Assessment Final Report. Report submitted to the U.S.D.A. Forest Service, Juneau, Alaska.

Jesperson, Michele and Kristen Griffin

1992 An Evaluation of Archaeological Injury Documentation, Exxon Valdez Oll Spill. Report prepared at the direction of the CERCLA Archaeological Steering Committee.

McAllister, Martin E.

1992 Monetary Damage Assessment for Archaeological Injuries Documented in the Exxon Valdez Oil Spill Response Records, Report submitted to the National Park Service, Anchorage, Alaska,



Mobley, Charles M., James C. Haggarty, Charles J. Utermohle, Morley Eldridge, Richard E. Reanier, Aron Crowell, Bruce A. Ream, David R. Yesner, Jon M. Erlandson, and P.E. Buck, with an appendix by William B. Workman and Karen W. Workman.

1990 The 1989 Exxon Valdez Cultural Resource Program. Exxon Shipping Company and Exxon Company, U.S.A. Anchorage.

D. Schedule

May 1, 1994 Contractual arrangements for logistics and to process radiocarbon, pollen, phytolith, macrobotanical, and soll samples will be initiated.

August 1, 1994: Field work commences.

October 15, 1994 Draft reports of fieldwork results will be completed.

March 1, 1995 Final field reports will be submitted to DNR for compilation into final report.

May 31, 1995 Final report to Trustees will be submitted for Project 94007

Project personnel will include a GS-11 project leader, a GS-9 assistant project leader, a GS-7 archaeological crew leader, 2 GS-5 archaeological crew members, a Surveyor and GS4/5 Engineering Tech, A GS-11 geologist, and a GS-11 graphic artist. The GS-11 project leader will plan the project, make arrangements for contracts, supervise field work, and write the final report. The GS-9 will assist the project leader in finalizing logistics and in the field, will excavate and oversee field work in the event that the project leader is temporarily unavailable, and will assist in laboratory analysis and in writing the draft report. The GS-7 crew leader will assist in field preparation, in excavation and supervising crew members, and in laboratory analysis and data entry. The two GS-5 crew members will conduct archaeological field work under the supervision of the other members of the team. The Surveyor and Engineering Tech will establish or relocate a datum at each site in relation to GPS coordinates. establish a north-south grid prior to initiation of field work, and develop a .5 meter contour map of each site in relation to the established datum. The GS-11 geologist will study the terrain in the vicinity of each site and report on the tectonic and seismic history of each site area, and the site areas in relation to the overall Prince William Sound region. The GS-11 graphic artist will assist in preparing site maps and profiles from field notes for the final report.



GS-5 Archaeological crew members

The logistic needs for successful completion of the restoration project include round-trip transportation between the field camp and Anchorage, daily transportation between the field camp and site, food and lodging for crew members in the field, and computing and laboratory facilities for analysis of the archaeological materials and scientific samples.

E. Existing Agency Program

The Chugach National Forest program is oriented towards specific projects and inventory, however the Forest does not have an on-going field program dedicated to archaeological site restoration in the oil spill area. Archaeological activities in the spill area are undertaken on a specific, short-term basis relative to the specific needs.

F. Environmental Compliance/Permit/Coordination Status

Due to internal regulations, the Chugach National Forest is developing its own Environmental Assessment (EA) for this project. The draft EA will be completed by March 31, 1994. It is expected that the outcome of this process will be substantially similar to the National Park Service EA prepared for 1993 Restoration work. Any mitigation measures identified through National Environmental Policy Act (NEPA) compliance will become part of the project.

The proposed project is subject to the provisions of the National Historic Preservation Act (NHPA), the Archaeological Resources Protection Act (ARPA), and the Native American Graves and Repatriation Act (NAGPRA). The project will be carried out in conformance with the consultative processes and standards demanded by these legislative mandates. Coordination between project agencies, and consultation and/or coordination with Native village and regional organizations will be accomplished as necessary.

The proposed action complies with the Endangered Species Act, the Marine Mammals Protection Act, and Executive Orders 11988 and 11990. There will be no restriction of subsistence activities as documented by the Alaska National Interest Lands Conservation Act, Title VIII, Section 810(a) Summary of Evaluation and Findings.

G. Performance Monitoring

Meeting project deadlines and objectives as outlined in the schedule section will be the measure of performance for this project. Normal agency supervisory chain-of-command will insure compliance with project goals in the allotted time and continuity in the event of personnel changes. The final product which will be





generated will be a project report as mentioned above under Methods, which will be supplied to the State Office of History and Archaeology

H. Coordination of Integrated Research Effort:

The USDA Forest Service archaeological program deals with the effect of normal agency activities on sites, but is not related to the sites being restored. Information obtained during the course of the site restoration process will be integrated into the site inventory program, and considered during future Forest Plan revisions.

I. Public Process:

The public will be involved in the project as required by NEPA, NHPA, and NAGPRA, and will have an opportunity for involvement during the draft review phase. Site specific restoration activities are subject to site location restrictions as required by ARPA.

J. Personnel Qualifications

Curriculum vitae for key Forest Service personnel are attached.

K. Budget

See detailed project budget forms 3A and 3B.

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NO DETAILED PROJECT DESCRIPTION REQUIRED --PROJECT IS A CONTINUATION OF PREVIOUSLY APPROVED WORK

BRIEF PROJECT DESCRIPTION FOLLOWS

EXXON VALDEZ OIL SPILL PROJECT DESCRIPTION

itle: Black Oystercatcher Interaction with Intertidal Communities

Project Number: 9402	20		
Lead Agency: DOI-FW	/S		
Cooperating Agency:	None		
Cost of Project, FY94:	\$148.9K	Cost of Project, FY95:	\$19.6K
Project Startup Date:	October 1993	Duration: 1.5 years	
Geographic Area:	Field data collectic Anchorage, AK; 1 University	on - Prince William Sound lydrocarbon analysis - G	, AK; data analysis ERG, Texas A&M

INTRODUCTION

Black oystercatchers were directly and indirectly affected by the *Exxon Valdez* oil spill. Oystercatchers died as a result of contact with crude oil. Additionally, disturbance caused by shoreline oiling and the subsequent cleanup 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 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 retained 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

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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. Resource and/or Associated Service

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.
- To determine the extent of use of oiled substrates by foraging oystercatchers during June and July of 1994.
- To monitor changes in the breeding population of black oystercatchers in oiled and unoiled areas of central PWS.

Project Description

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 within 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.

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

/essel 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 farine and Sea Marita Boatworks.

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

CHEDULES

1	994	

	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

To other agency program monitors the interaction of black oystercatchers and oiled prey esources in the spill area. The boat survey project monitors the population of systercatchers in PWS on a large scale. Logistical support, including a 25' boat (\$70K) and arious field camp needs (\$5K), is provided by the USFWS.

Project Description

ENVIRONMENTAL COMPLIANCE/PERMIT/COORDINATION STATUS

This study is non-intrusive and primarily involves 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)

	FWS
Personnel	73.4
Travel	4.1
Contractual	48.0
Commodities	7.0
Equipment	2.0
Capital Outlay	0.0
Sub-total	134.5
General Administration	14.4
Project Total	148.9
NEPA Compliance	0.0

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EXXON VALDEZ TRUSTEE COUNCIL FY 94 DETAILED PROJECT DESCRIPTION

A. COVER PAGE

Project title: Common Murre Population Monitoring Project ID number: 94039 Project type: Restoration Monitoring Name of project leader(s): David G. Roseneau Lead agency: DOI-FWS Cooperating agencies: None Cost of project/FY 94: \$227.2K Cost of project/FY 95: \$30.5K Cost of project/FY 96 and beyond: \$0.0K Project Start-up/Completion Dates: February 1, 1994/April 15, 1995 Geographic area of project: 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 DOI-FWS Alaska Maritime National Wildlife Refuge office, 2355 Kachemak Bay Dr. (Suite 101), Homer, Alaska 99603-8021

Project leader:

Date: 18 MARO

Date: 18 March 94

Dávid G. Roseneau, Wildlife Biologist, DOI-FWS (Alaska Maritime NWR)

Project manager:

9. Vernon Byrd

G. Vernon Byrd, Wildlife Biologist, DOI-FWS (Alaska Maritime NWR)

B. INTRODUCTION

Many murres were killed during the T/V Exxon Valdez oil spill (EVOS). Before the EVOS event occurred on 24 March 1989, it was estimated that about 250,000 common and thickbilled murres (U. aalge and U. lomvia) nested at 31 colonies in the spill area, and 80-90% of these diving, fish eating seabirds were reported to be common murres (Sowls et al. 1978, USFWS 1991). When winds and currents swept oil through the region in April and early May, large numbers of murres were already present near the nesting colonies (Piatt et al. 1990), and many of these birds died as a result of being oiled. Murres comprised about 74% of 30,000 bird carcasses recovered by 1 August and mortality of all bird species was initially estimated to be 100,000-300,000 individuals (Piatt et al. 1990). These figures suggested that 74,000-222,000 murres died during the spill. Later, a computer modeling study that relied on a review of the recovered carcasses, a 72% murre component, and the release of carcasses at sea estimated that 375,000-435,000 birds of all species died during the event (ECI 1991). This higher estimate of total bird kill suggested that murre losses were in the 271,500-314,900 bird range. [Note: Pre-spill murre estimates were adjusted to correct errors in the Colony Catalog Archive-e.g., 30,000 vs 20,000 birds listed for Nord Island, which was a typographical error in Bailey (1976); 100,000 vs 61,000 birds listed for East Amatuli Island, which was double Manuwal's (1980) initial 50,000 bird estimate (see below).]

The Barren Islands, between the Kenai Peninsula and the Kodiak Archipelago, supported one of the largest concentrations of murres and other seabirds in the path of the oil (e.g., Sowls *et al.* 1978, Piatt *et al.* 1990, USFWS 1991). Because concerns about the health and well-being of common murres were high and large previously studied murre colonies were present in these oil-contaminated islands, damage assessment and restoration studies were conducted there during 1989-1991 and 1992-1993, respectively (e.g., Nysewander and Dipple 1991, Dipple and Nysewander 1992, Dragoo *et al.* 1993, Nysewander *et al.* 1993, FWS unpubl. data). This Detailed Project Description for Project No. 94039 describes the additional restoration work that will be undertaken at the injured Barren Islands murre colonies in FY1994.

In 1990-1992, some common murre data were collected during University of Washington (UW) and Dames & Moore projects in the Barren Islands (see Relation to Other Damage Assessment/Restoration Work below). Some information reported in these studies differs from the information reported in the 1990-1992 DOI-FWS studies. During Project No. 94039, all available post-spill data will be reviewed in an effort to explore the differences between these two data sets.

C. PROJECT DESCRIPTION

Project No. 94039 is designed to continue monitoring trends in numbers, productivity, and phenology of common murres at the Barren Islands colonies that were affected by the EVOS event. Birds will be censused on East Amatuli Light Rock and East Amatuli and Nord islands (Figure 1), and data on reproductive success and timing of nesting activities will be obtained from previously established population plots. The FY1994 information will be used to evaluate and describe the recovery of this injured species at these important Gulf of Alaska nesting locations six years after the EVOS event. Also, because some DOI-FWS and UW findings disagree (see Introduction), all available data will be reviewed to help explain the differences that occur between some of the estimates of numbers, phenology, and productivity reported by the studies. [Note: This effort is already underway and some differences will be discussed in the upcoming FY1993 field report.]

1. Resources and/or Associated Services

Common murres are the injured resource that will be studied during this restoration monitoring project. The work will benefit both the species and the public because information obtained during the study will help refine perspective on the degree of injury sustained by these Gulf of Alaska seabird populations as a result of the EVOS event. Murres will benefit because 1994 numbers and productivity data from the Barren Islands colonies will help resource managers determine whether other measures need to be taken to ensure full recovery of these injured populations to pre-spill levels. The public will benefit because they will have access to additional information on the status of the avian species that apparently suffered the greatest direct mortality from floating oil. The public will also benefit because computer simulation models developed for the Exxon Valdez Trustee Council that estimate recovery rates for murre populations (e.g., Heinemann 1993) can utilize the 1994 productivity and census data to refine the model to more accurately predict rates of recovery for this injured species. Private sector businesses offering sight-seeing and birding tours to the Barren Islands will benefit from having access to current information on the status of the injured populations that will help them plan trips, prepare lectures, and be of interest to their clients.

2. Relation to Other Damage Assessment/Restoration Work

This study is directly related to the damage assessment/restoration projects conducted by DOI-FWS in 1989-1993. These studies are listed below.

- a. Damage assessment work conducted in 1989-1991 during Bird Study No. 3 (see Nysewander et al. 1993).
- b. Restoration work conducted in 1992 during Restoration Project No. 11 (see Dragoo et al. 1993).
- c. Restoration work conducted in 1993 during Restoration Project No. 93049 (Roseneau D.G., A.B. Kettle, G.V. Byrd, and J.A.Cooper. Effects of the *T/V Exxon Valdez* oil spill on murres: Observations at Barren Islands breeding colonies five years after the spill. Restoration Project No. 93049. In Preparation. Annu. rept. by the U.S. Fish Wildl. Serv., Homer, AK).

Also, UW staff collected numbers and productivity data on murres in the Barren Islands for Exxon during 1990-1991(see Boersma *et al.* 1993) and D&M surveyed murre colonies in these islands at at other locations for Exxon in 1991 (see Erikson, D.R. 1993). UW staff also studied other seabirds at East Amatuli Island for the Minerals Management Service (MMS) in 1992 (primarily storm-petrels and puffins; see Boersma, P.D. 1993. Status of select species of seabirds nesting on East Amatuli Island, Barren Islands, Alaska. 1992 interim rept. to MMS, Anchorage, AK. 28 pp. plus append.), and in 1993 they continued this work and also collected some murre phenology/productivity data on four small plots at East Amatuli Light Rock with time-lapse cameras for Exxon. [Note: Reports from UW 1993 work are not available. DOI-FWS researchers counted all UW and DOI-FWS East Amatuli Island and East Amatuli Light Rock population plots in 1993 and gave these raw data to UW investigators in early October 1993, but UW plot count data collected for MMS in 1992-1993 have not been provided to either MMS or DOI-FWS as of 10 March 1994.]



3. Objectives

Project No. 94039 has two primary objectives. The first goal is to monitor the recovery of common murre populations in the Barren Islands. This objective will be met by recensusing birds on all previously established population plots at the colonies in July-August, collecting productivity data at nest sites on two sets of previously established productivity plots during. June-September, and comparing this information with data available from previous DOI-FWS damage assessment and restoration work and UW studies. The second goal is to explain the differences that occur between some of the estimates of numbers, phenology, and productivity reported by the DOI-FWS and UW studies. This objective will be met by continuing a review of all available UW data and DOI-FWS damage assessment and restoration data collected during 1989-1992.

4. Methods

a. Data Collection

Data collection methods will closely follow the methods employed during the 1993 DOI-FWS Barren Islands common murre restoration study. Counts of birds will be made using standard seabird colony census protocol. These conventions include making counts during the correct portion of the breeding season and correct times of day (i.e. between the peak of egglaying and first sea-going of chicks and during times of day when attendance on the nesting cliffs is most stable—e.g., Birkhead and Nettleship 1980, Springer *et al.* 1985, Murphy *et al.*1986). On the basis of 1993 data, the 1994 census period will probably run from about late July until the end of August, and the best times for counts will be during 1100 hr - 2000 hr Alaska Daylight Time.

All murres (except chicks) will be counted on East Amatuli Light Rock (about 8,500 birds in 1993) and East Amatuli and Nord islands (about 24,000 and 13,500 birds in 1993, respectively) two to four times during the census period. Also, previously censused subsets of the East Amatuli and Nord island population plots will be counted at least five (preferably seven) times during the same season (these samples consist of about 6,000 birds on eight plots and 4,000 birds on 11 plots, respectively), and birds will also be counted at least 10 times on two sets of productivity plots (see below). In addition, two time-lapse video cameras will be set up to record hourly and daily attendance patterns (one at each island; backup units will be available).

The population counts will be made with binoculars by two observers working from small boats in calm weather. Birds will be counted by 10's, and the observers' simultaneous but independent scores will be averaged for each plot. If scores vary by more than about 10%, plots will be recounted until the scores satisfy this criteria. Birds will also be counted on the productivity plots by one observer stationed at a land-based observation post. These counts will be made by 1's during the productivity observations. [Note: In some cases, sea conditions and plot locations can make it difficult for observers to meet the 10% criteria at some population plots. If this happens, all counts that are not extremely low or high will be averaged to produce a final score and the basis for the score will be reported in footnotes.]

Information on nesting phenolgy and productivity of murres will also be obtained at the Nord and East Amatuli island colonies. These data will be collected from eight productivity plots set up on Nord Island during 1990-1992 (6 plots) and 1993 (2 plots) and 10 plots created on East Amatuli Island in 1993 (the two sets of plots contain about 190 and 250 nest sites, respectively). Observations will be made every three to four days during the nesting season, weather permitting, to determine first egg-laying dates and peak laying, halching, and fledging dates. These observations will also provide data on reproductive success (e.g., numbers of eggs laid, eggs hatched, and chicks fledged per pair, plot, and total number of adults). Observations will start before eggs are laid and end after chicks start leaving nest sites.

Any factors or events that might influence numbers and productivity data will be noted during the work (e.g., disturbances caused by boats or predators, predation of eggs and chicks, weather events).

b. Data Analysis

During the first phase of data analysis, all previously collected post-spill information will be reviewed. The review of these data will be used to clarify differences between DOI-FWS and UW reports. [Note: The review process is already underway.]

The 1994 numbers, productivity, and phenology data will be compared with similar data from pre- and post spill years (1975-1979 and 1989-1993, respectively). Data will be analyzed for trends and intraseason and interannual variability to check whether any observed trends are statistically significant.

Population analysis will test the null hypothesis that there is no evidence populations have changed in size in the Barren Islands since the EVOS event. The sample unit will be the sum of counts of murres on all plots on a given day. ANOVA will be used to determine whether counts differ among years. Multiple comparisons will be made if the null hypothesis is rejected. Linear regression analysis will be conducted to evaluate trends in numbers over the 6-year post-spill period. During this analysis, residuals will be examined for any departures from linear relationships.

For analysis of productivity and phenology data, the sample unit will be a cluster of nests (i.e., a "plot"). Summary statistics will be calculated and compared with a series of data obtained at other colonies in the Gulf of Alaska before the spill or outside the spill area to test the null hypotheses that 1994 Barren Islands data are the same as data from populations not affected by the spill. Historical data on timing of nesting events and reproductive success of murres in the Barren Islands are too sparse to permit rigorous interannual comparisons. However, regression analysis will be employed to test for trends between 1989 and 1994 in two parameters, dates of first egg-laying and numbers of chicks produced per adult.

c. Alternatives

No other alternatives are available to conduct the monitoring work and collect the same types of information needed for comparison with data obtained in previous years. Methods used for censusing populations and measuring productivity are designed to detect long-term trends and follow standard procedures and protocols developed by seabird biologists working at large colonies over the past 15 years. Time-lapse cameras could be used for collecting productivity data. However, in spite of these devices providing near-contineous records and saving personnel time in the field, they are costly, limit observations to relatively small fields of view (thereby reducing sample size and increasing need for more units), generally decrease the number and kinds of habitats that can be sampled, and do not gather



ancillary data that may shed additional light on observed trends in productivity (i.e., information on predation, food availability).

5. Location

The restoration monitoring project will be conducted at Nord and East Amatuli islands and East Amatuli Light Rock in the Barren Islands, about 75 km south-southwest of Homer, Alaska between the Kenai Peninsula and the Kodiak Archipelago (Figure 1). These locations contain all previously established murre population and productivity plots. No communities will be affected by the study.

6. Technical Support

The project does not require technical support.

7. Contracts

A large vessel will be contracted to support the population and productivity work. Contracting is required because estimated cost exceeds purchase order limits. The vessel will be procured through the standard competitive bidding process used by DOI-FWS. Also, two SCA volunteers will be contracted from the Student Conservation Association to assist field crews.

8. Literature Cited

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D. SCHEDULE

1. FY1994 Milestones

Jan-Mar 94 Complete 1993 report, recruit seasonal employees for 1994 field work.

- <u>Apr-Jun 94</u> Prepare population plot photo guides and data forms, plan logistics, select charter vessel, purchase and pack equipment and supplies, interview/select/train seasonal employees and volunteers, re-establish field camps at East Amatuli and Ushagat islands.
- Jun-Sep 94 Occupy field camps at East Amatuli and Ushagat islands to collect data on phenology/reproductive success and make multiple counts of selected population plots at East Amatuli and Nord Islands.
- Jul-Aug 94 Conduct population census work at East Amatuli and Nord islands and East Amatuli Light Rock by counting all previously established boat-based population plots (the plots include all murres nesting on these islands and the work will be done from inflatable boats supported by the contract vessel).
- <u>Sep 94</u> Return field equipment and personnel to Homer; clean, inventory, and store equipment.
- 2. FY1995 Milestones
- Oct-Dec 94 Analyze 1994 data and compile draft report of 1994 activities.
- Jan-Mar 95 Prepare final report of 1994 activities, archive data and photos. Draft report to Oil Spill Coordinator March 15, 1995; final report to Chief Scientist April 15, 1995.

3. Project Personnel

G. Vernon Byrd: Project Manager supervising planning and training; also assists during population counts, data analysis, and report writing.

David G. Roseneau: Project Leader in charge of all aspects of field work, including logistics, planning, training field crews, data collection and analysis; conducts census work; principal report writer.

Ushagat Island

Camp Leader 1: Responsible for boating operations and collecting data on phenology and productivity at Nord Island; conducts multiple plot counts; assists Project Leader during census.

Bio Technician 1: Assists Camp Leader 1 in collecting data at Nord Island.

SCA Volunteer 1: Assists Camp Leader 1 in collecting data at Nord Island.

East Amatuli Island

Camp Leader 2: Responsible for boating operations and collecting data on phenology and productivity at East Amatuli Island; conducts multiple plot counts; assists Project Leader during census.

Bio Technician 2: Assists Camp Leader 2 in collecting data at East Amatuli Island and East Amatuli Light Rock.

SCA Volunteer 2: Assists Camp Leader 2 in collecting data at East Amatuli Island.

4. Logistics

a. Field camps

Field camps are needed at East Amatuli and Ushagat islands to support crews conducting multiple counts of selected plots and collecting data on reproductive success and timing of nesting events at East Amatuli and Nord islands.

b. Vessel Support

A large vessel is needed during mobilization and demobilization the East Amatuli and Ushagat island field camps and to support the population census work in July-August, particularly at Nord Island, where tide rips can sometimes prevent small boats from safely crossing the strait and reaching calmer nearshore waters during otherwise workable opportunities to census the colony. The vessel is also needed to help support the Nord Island productivity work late in the field season during the fledging period, when rapidly changing weather conditions can force field crews relying solely on small boats to abandon the area and recross the strait before completing observations of nest sites.

c. Helicopter Support

A light helicopter is needed to transport personnel to and from field camps on East Amatuli and Ushagat islands during some phases of the work, because in some cases, helicopters are more efficient and cost effective than large vessels.

E. EXISTING AGENCY PROGRAM

The DOI-FWS Alaska Maritime National Wildlife Refuge and National Biological Survey (NBS) have existing, coordinated programs to monitor murre and other seabird populations at selected locations in the Gulf of Alaska and other Alaskan waters. However, the Barren Islands, as part of these existing agency programs, are designated as monitoring sites for only fork-tailed storm-petrels (*Oceanodroma furcata*) and tufted puffins (*Fratercula cirrhata*) because of the expense and difficulty of studying murres at this location. Therefore, under normal conditions (i.e., without occurrance of the EVOS event) detailed data on numbers and productivity of common murres would not be collected at these Gulf of Alaska colonies. In addition to the Project 94039 restoration monitoring study in the Barren Islands, murres will be monitored in a similar fashion at one other location in the spill area and several other locations outside of it during the 1994 field season as part of existing agency work, if funding is approved (NBS, Semidi Islands inside spill area, Middleton Island outside spill area;



FWS/AMNWR. Cape Lisburne and St. Lazaria, Chisik, Pribilof, Bogoslof, Buldir, and Agattu islands outside spill area). The approximate cost of these agency projects is about \$200.0K.

F. ENVIRONMENTAL COMPLIANCE/PERMIT/COORDINATION STATUS

Project 94039 relies on observation from boats or from observation points removed from nesting ledges and is a non-intrusive study. No permits are required, and based on review of CEQ regulation 40 CFR 1500-1508, this project has been determined to be categorically exempt from the requirements of NEPA, in accordance with 40 CFR 1508.4.

G. PERFORMANCE MONITORING

1. Chain-of-Command

The chain-of-command for the project is as follows: SCA volunteers and Bio Techs are supervised by and report to their respective Camp Leaders. Camp Leaders are supervised by and report to the Project Leader, and the Project Leader is supervised by the Project Manager. The Project Manager and Project Leader report to the Program Manager.

2. Backup Strategy

If either the Project Manager (G.V. Byrd) or Project Leader (D.G. Roseneau) leaves or is incapacitated prior to project completion, the remaining senior study team member will assume the other person's duties until a replacement can be selected and hired (selection and hiring would be done on an ASAP basis). Also, emergency hiring procedures will be implemented, if field personnel are injured or cannot otherwise perform their assigned tasks and other refuge personnel cannot assume these duties.

3. Quality Assurance and Control

Product quality will be ensured by:

a. Using experienced personnel to collect and analyze data (the Project Leader and both Camp Leaders worked on the murre monitoring project in the Barren Islands in 1993, and both the Project Leader and Project Manager have extensive experience conducting similar studies and analyzing similar types of data).

b. Training new field crew members and refreshing current members in proper procedures, including practicing census techniques in Kachemak Bay and reviewing video-tapes of nesting behavior before traveling to project study sites.

c. Following standard, accepted procedures/protocols during productivity and census work (e.g., making counts during correct periods and times of day during the breeding season, recounting plots if observer counts vary more than 10%, making multiple counts of selected plots to allow statistical comparisons).

d. Reviewing and monitoring data collection, recording, and analysis methods on a regular basis in both the field and the office to ensure product quality.



4. List of Products

A final report on the 1994 restoration monitoring study that will compare productivity and numbers data with previous information from the Barren Islands study sites.

H. COORDINATION OF INTEGRATED RESEARCH EFFORT

Project 94039 is being coordinated with other DOI-FWS and NBS seabird monitoring studies in the Gulf of Alaska and elsewhere (e.g., Bering Sea). Several pieces of refuge equipment normally used in other studies will be available for the work, including four outboard motors, two inflatable rafts, two SSB radios, three tents, and two tool-kits. Also, a variety of extra camping and office supplies will be used in the field, and up to three FWS biologists may be available to assist during the census work, if conflicts do not arise between the timing of these efforts and their work at other Gulf of Alaska and Bering Sea study sites. Also, methods for collecting and analyzing data are being coordinated with other DOI-FWS and NBS murre studies to ensure that meaningful comparisons can be made between data sets.

I. PUBLIC PROCESS

A work plan describing the proposed FY94 study was submitted to the Exxon Valdez Trustee Council in early fall 1993, and this document was available to the public for review. Also, previous damage assessment and restoration project reports, including the 1993 field report, and findings from this study will be available to the public. Information from the 1994 work will also be presented to the public via workshops and symposiums. In addition, private sector businesses are being given the opportunity to bid on the 1994 vessel contract work.

J. PERSONNEL QUALIFICATIONS

Both the Project Leader, David G. Roseneau, and the Project Manager, G. Vernon Byrd, are well qualified to undertake the proposed study. Brief descriptions of the qualifications of these key personnel are provided below.

1. Project Leader - David G. Roseneau

David Roseneau received his B.S. degree in wildlife management and M.S. degree in biology from the University of Alaska - Fairbanks in 1967 and 1972, respectively. His thesis research was on gyrfalcons, *Falco rusticolus*. He joined the U.S. Fish and Wildlife Service in January 1993, and was Project Leader of the murre restoration monitoring work in the Barren Islands in 1993 (Project No. 93049). Prior to 1993, he was a consulting biologist for 20 years, and he has conducted and managed marine bird, raptor, and large mammal projects in Alaska and Canada for government agencies and private-sector clients. Mr. Roseneau has been involved in several large-scale murre (*Uria* spp.) population monitoring projects. During 1976-1983, as co-principal investigator of NOAA/OCSEAP Research Unit 460, he conducted monitoring studies of murres and black-legged kittiwakes (*Rissa tridactyla*) at capes Lisburne, Lewis, and Thompson in the Chukchi Sea, and St. Lawrence, St. Matthew, and Hall islands in the Bering Sea. He also studied auklets (*Aethia* spp.) at St. Lawrence and St. Matthew islands, and participated in murre and kittiwake projects at Bluff in Norton Sound. In 1984-1986, he participated in follow-up studies of murres and kittiwakes in the

northeastern Chukchi Sea, and during 1987-1988 and 1991-1992, he helped conduct additional murre and kittiwake work at capes Lisburne and Thompson and Chamisso and Puffin islands. Mr. Roseneau is experienced in collecting and analyzing data on numbers, productivity, and food habits of seabirds; relating trends in numbers and productivity to changes in food webs and environmental parameters (e.g., air and sea temperatures, current patterns): and assessing potential impacts of petroleum exploration and development on nesting and foraging marine birds. Also, he has operated inflatable rafts and other outboardpowered boats in the Bering, Chukchi, and Beaufort seas and on various Alaskan rivers in excess of 2,800 hrs. Mr. Roseneau has also accrued several hundred hours operating time in rafts, skiffs, and larger, more powerful vessels (e.g. 25 ft, 300-400 hp HydroSports and Boston Whalers) in Kachemak Bay, Prince William Sound, and Kenai Peninsula and Barren Island waters (prior to his 1993 work, he spent 6 weeks on East Amatuli Island in 1965 and discovered the fork-tailed storm-petrel (Oceanodroma furcata) colony there-see Isleib, P. and B. Kessel. 1973. Birds of the north gulf coast - Prince William Sound region, Alaska. Biol, Paper No. 14. Univ. of Alaska Press]. During his career, Mr. Roseneau has authored and co-authored over 65 reports and publications, including 22 on Alaskan seabirds.

Selected Seabird Publications

- Murphy, E.C., A.M. Springer, and D.G. Roseneau. 1991. High annual variability in reproductive success of kittiwakes (Rissa tridactyla L.) at a colony in western Alaska. J. Anim. Ecol. 60: 515-534.
- Springer, A.M., E.C. Murphy, D.G. Roseneau, C.P. McRoy, and B.A. Cooper. 1987. Paradox of pelagic food webs in the northern Bering Sea - I. Seabird food habits. Cont. Shelf Res. 7: 895-911.
- Murphy, E.C., A.M. Springer, and D.G. Roseneau. 1986. Population status of Uria aalge at a colony in western Alaska: results and simulations. Ibis 128: 348-363.
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- Springer, A.M., D.G. Roseneau, E.C. Murphy, and M.I. Springer. 1984. Environmental controls of marine food webs: food habits of seabirds in the eastern Chukchi Sea. Can. J. Fish Aquat. Sci. 41: 1202-1215.

2. Project Manager - G. Vernon Byrd

Vernon Byrd received a B.S. degree in wildlife management from the University of Georgia in 1968, did post-graduate studies in wildlife biology at the University of Alaska-Fairbanks in 1975, and completed a M.S. degree in wildlife resources management (with an emphasis in applied statistics) from the University of Idaho in 1989. His thesis research was on kittiwakes (*Rissa* spp.) and murres (*Uria spp.*) in the Pribilof Islands. Mr. Byrd has worked for the U.S. Fish and Wildlife Service for over 20 years, focusing on studies of marine birds in Alaska and Hawaii. His major interests center around monitoring long-term trends in seabird populations, including numbers of birds and reproductive performance at colonies. He has worked at murre colonies in the Aleutian Islands, the Bering and Chukchi seas, and western Gulf of Alaska. Mr. Byrd was a coauthor of the final *T/V Exxon Valdez* oil spill damage assessment report for murres. He has written over 40 scientific papers and 50 U.S. Fish and Wildlife Service reports on field studies, and he has presented over 15 papers on seabirds at scientific meetings. Mr. Byrd currently serves as supervisory wildlife biologist at the Alaska Maritime National Wildlife Refuge, the premier area for seabirds in the national public land system.

Selected Publications



- Byrd, G.V., E.C. Murphy, G.W. Kaiser, A.J. Kondratyev, and Y.V. Shibaev. (In press). Status and ecology of offshore fishfeeding alcids (murres and puffins) in the North Pacific Ocean. Proceedings of "Symposium on the Status", Ecology, and Conservation of Manne Birds of the Temperate North Pacific". Canadian Wildlife Service, Ottawa.
- Springer, A.M. and G.V. Byrd. 1989. Seabird dependence on walleye pollock in the southeastern Bering Sea. Pages 667-677 in Proceedings of the International Symposium on the Biology and Management of Walleye Pollock. Alaska Sea Grant Rep. No. 89-1, Univ. of Alaska-Fairbanks.
- Day, R.H. and G.V. Byrd. 1989. Food habits of the whiskered auklet at Buldir Island, Alaska. Condor 91:65-72.
- Byrd, G.V., J.L. Sincock, T.C. Teller, D.J. Moriarty, and B.G. Brady. 1984. A cross-fostering experiment with Newell's race of Manx shearwater. J. Wildl. Manage. 48:163-168.
- Byrd, G.V., D.I. Morlarty, and B.G. Brady. 1983. Breeding biology of wedge-tailed shearwaters at Kilauea Point, Hawaii. Condor 85:292-296.

K. BUDGET

Cost breakdowns for the FY94 restoration project are shown on Forms 2A and 2B. The total cost is the same as indicated in the Draft 1994 Work Plan (\$227.2K, including 1993 Court Request funds and \$200.3K recently approved for 1994 field work). However, some category totals shown in the "Remaining Cost FFY94" column of the budget have been revised slightly during the detailed planning process.

The cost shown for FFY95 (\$30.5) is the amount needed to close out the new work that will be undertaken during February 1 - September 30, 1994. The close-out work will consist of analyzing data collected during the 1994 field season and writing a report describing those activities.





Figure 1. The Barren Islands, Alaska Project 94039 study area: Field camps will be located on East Amatuli and Ushagat islands, and field work will be conducted at previously established murre population/productivty plots on East Amatuli Light Rock and East Amatuli and Nord islands (shading indicates Islands with historical murre population/productivity data).



Project Description: This project is designed to monitor the recovery of murres (Uria spp.) at colonies in the Gulf of Alaska affected by the T/V Exxon Valdez oil spill. The 1994 work will focus on determining trends in numbers and productivity of populations nesting in the Barren Islands. Plans also call for monitoring monitoring these colonies in 1995 and 1996, but in 1996, (the last proposed field season), numbers and productivity data will also be collected at other Gulf of Alaska locations, including Puale Bay and the Ugaiushak, Semidi, Triplet and Chiswell Islands.

	1993 Project No.	'93 Report/	Remaining				
Budget Category	93022/93049	'94 Interim*	Cost**	Total			
	Authorized FY93	FFY 94	FFY 94	FFY 94	FFY 95	Comment	
Personnel	\$80.0	\$23.4	\$89.7	\$113.1	\$25.2	FFY95 costs are for analyzing data & writing	
Travel	\$13.6	\$0.0	\$13.3	\$13.3	\$0.5	the report for work conducted in FFY94.	
Contractual	\$55.5	\$0.0	\$54.8	\$54.8	\$0.0		
Commodities	\$8.2	\$0.0	\$11.2	\$11.2	\$1.0	Note: Remaining FFY 94 personnel costs	
Equipment	\$4.0	\$0.0	\$14.0	\$14.0	\$0.0	include \$6.6K for overtime costs for field	
Capital Outlay	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	personnel during June 15 - September 15.	
Subtotal	\$161.3	\$23.4	\$183.0	\$206.4	\$26.2	1994. These funds are necessary to permit	
General Administration	\$15.9	\$3.5	\$17.3	\$20.8	\$3.8	temporary personnel to work more than	
Project Total	\$177.2	\$26.9	\$200.3	\$227.2	\$30.5	8 hrs/day & on weekends to take maximum	
						advantage of good weather conditions	
Full-time Equivalents (FTE)	2.4	0.8	2.6	3.4	0.8	during critical data collection periods.	
	Dollar	amounts are s	hown in thouse	ands of dollars			
Budget Year Proposed Person	nel:	Reprt/Intrim	Reprt/Intrim	Remaining	Remaining		
Budget Year Proposed Person Position Description	nel:	Reprt/Intrim Months	Reprt/Intrim Cost	Remaining Months	Remaining Cost		
Budget Year Proposed Person Position Description	nel:	Reprt/Intrim Months	Reprt/Intrim Cost	Remaining Months	Remaining Cost		
Budget Year Proposed Person Position Description Project Leader , GS-11	nel:	Reprt/Intrim Months 4.0	Reprt/Intrim Cost \$15.7	Remaining Months 8.0	Remaining Cost \$32.0		
Budget Year Proposed Person Position Description Project Leader, GS-11 Biological Science Technician,	GS-6	Reprt/Intrim Months 4.0 3.0	Reprt/Intrim Cost \$15.7 \$5.6	Remaining Months 8.0	Remaining Cost \$32.0		
Budget Year Proposed Person Position Description Project Leader, GS-11 Biological Science Technician, Biological Science Technician	GS-6 3S-5	Reprt/Intrim Months 4.0 3.0 1.0	Reprt/Intrim Cost \$15.7 \$5.6 \$2.1	Remaining Months 8.0	Remaining Cost \$32.0		
Budget Year Proposed Person Position Description Project Leader, GS-11 Biological Science Technician, Biological Science Technician (Program Manager, GS-12	GS-6 GS-5	Reprt/Intrim Months 4.0 3.0 1.0	Reprt/Intrim Cost \$15.7 \$5.6 \$2.1	Remaining Months 8.0 1.2	Remaining Cost \$32.0 \$6.0		
Budget Year Proposed Person Position Description Project Leader, GS-11 Biological Science Technician, Biological Science Technician (Program Manager, GS-12 Project Manager, GS-12	GS-6 3S-5	Reprt/Intrim Months 4.0 3.0 1.0	Reprt/Intrim Cost \$15.7 \$5.6 \$2.1	Remaining Months 8.0 1.2 1.5	Remaining Cost \$32.0 \$6.0 \$7.5		
Budget Year Proposed Person Position Description Project Leader, GS-11 Biological Science Technician, Biological Science Technician (Program Manager, GS-12 Project Manager, GS-12 2 Temporary Biologists, GS-6	GS-6 3S-5	Reprt/Intrim Months 4.0 3.0 1.0	Reprt/Intrim Cost \$15.7 \$5.6 \$2.1	Remaining Months 8.0 1.2 1.5 1.5 13.0	Remaining Cost \$32.0 \$6.0 \$7.5 \$28.6	NEPA Cost: \$0.0	
Budget Year Proposed Person Position Description Project Leader, GS-11 Biological Science Technician, Biological Science Technician (Program Manager, GS-12 Project Manager, GS-12 2 Temporary Biologists, GS-6 2 Temporary Biologists, GS-5	GS-6 3S-5	Reprt/Intrim Months 4.0 3.0 1.0	Reprt/Intrim Cost \$15.7 \$5.6 \$2.1	Remaining Months 8.0 1.2 1.5 1.5 13.0 8.0	Remaining Cost \$32.0 \$6.0 \$7.5 \$28.6 \$15.6	NEPA Cost: 50.0 *Oct 1, 1993 - Jan 31, 1994	
Budget Year Proposed Person Position Description Project Leader, GS-11 Biological Science Technician, Biological Science Technician Program Manager, GS-12 Project Manager, GS-12 2 Temporary Biologists, GS-6 2 Temporary Biologists, GS-5	GS-6 GS-5 Personnel Total	Reprt/Intrim Months 4.0 3.0 1.0	Reprt/Intrim Cost \$15.7 \$5.6 \$2.1 \$2.1	Remaining Months 8.0 1.2 1.5 13.0 8.0 31.6	Remaining Cost \$32.0 \$6.0 \$7.5 \$28.6 \$15.6 \$89.7	NEPA Cost: \$0.0 *Oct 1, 1993 - Jan 31, 1994 **Feb 1, 1994 - Sep 30, 1994	
Budget Year Proposed Person Position Description Project Leader , GS-11 Biological Science Technician, Biological Science Technician (Program Manager, GS-12 Project Manager, GS-12 2 Temporary Biologists, GS-6 2 Temporary Biologists, GS-5	GS-6 GS-5 Personnel Total	Reprt/Intrim Months 4.0 3.0 1.0	Reprt/Intrim Cost \$15.7 \$5.6 \$2.1 \$2.1	Remaining Months 8.0 1.2 1.5 13.0 8.0 31.6	Remaining Cost \$32.0 \$6.0 \$7.5 \$28.6 \$15.6 \$89.7	NEPA Cost: 50.0 *Oct 1, 1993 - Jan 31, 1994 **Feb 1, 1994 - Sep 30, 1994	
Budget Year Proposed Person Position Description Project Leader , GS-11 Biological Science Technician, Biological Science Technician (Program Manager, GS-12 Project Manager, GS-12 2 Temporary Biologists, GS-6 2 Temporary Biologists, GS-5 07/14/93	GS-6 GS-5 Personnel Total	Reprt/Intrim Months 4.0 3.0 1.0 8.0	Reprt/Intrim Cost \$15.7 \$5.6 \$2.1 \$23.4 \$23.4	Remaining Months 8.0 1.2 1.5 1.5 13.0 8.0 31.6	Remaining Cost \$32.0 \$6.0 \$7.5 \$28.6 \$15.6 \$89.7	NEPA Cost: \$0.0 *Oct 1, 1993 - Jan 31, 1994 **Feb 1, 1994 - Sep 30, 1994 FORM 2A	
Budget Year Proposed Person Position Description Project Leader , GS-11 Biological Science Technician, Biological Science Technician (Program Manager, GS-12 Project Manager, GS-12 2 Temporary Biologists, GS-6 2 Temporary Biologists, GS-5 07/14/93 Peer Rev	GS-6 GS-5 Personnel Total view Draft Pro	Reprt/Intrim Months 4.0 3.0 1.0 8.0 0ject Numbe	Reprt/Intrim Cost \$15.7 \$5.6 \$2.1 \$23.4 \$23.4 er: 94039 Common Mi	Remaining Months 8.0 1.2 1.5 13.0 8.0 31.6	Remaining Cost \$32.0 \$6.0 \$7.5 \$28.6 \$15.6 \$89.7 ion Monitor	NEPA Cost: \$0.0 *Oct 1, 1993 - Jan 31, 1994 **Feb 1, 1994 - Sep 30, 1994 FORM 2A PROJECT	

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Travel:	Reprt/intrm	Remaining
Ten (10) helicopter trips @ \$0.9K/trip Homer- Barren Islands-Homer to transport personnel to and from field camps (helicopters will be chartered through the Dept. of Interior Office of Aircraft Services on an "as-needed basis" and are more efficient and cost effective than vessels for some needs)		\$9.0
Other travel, including trips to Anchorage for meetings		\$1.5
Per diem for field crews and other trips and meetings (per diem for field personnel is calculated at \$3.00/day x 450 person days = \$1.35Kthis token daily amount must be paid to all FWS employees and non-SCA volunteers for each day spent in the field; per diem for other trips/meetings is calculated at \$241.00/day x 6 days = \$1.45K		\$2.8
Travel Total	\$0.0	\$13.3
Contractual:		
30 days of contract vessel time to support population counts and productivity work [30 days @ \$1.6K/day; bids for this work have been solicited from the private sector by the FWS Contracting & General Services Office (Solicitation No. FWS 7-94-03)]		\$48.0
2 Student Conservation Association (SCA) volunteers for 12 weeks to assist field crews. [Note: The Student Conservation Association is a non-profit educational organization that provides high school and college students, as well as people out of school, an opportunity to volunteer their services towards the conservation of natural resources on public lands. Each SCA volunteer costs \$3.0K per 12 week period, and this fee, paid to the SCA organization, covers travel costs to duty stations and a token \$88.00//week allowance. The SCA volunteers will be assigned to help the 2 two-person field crews stationed at East Amatuli and Ushagat Islands (i.e., each field camp will have one SCA volunteer assistant)		\$6.0
Film processing (for plot photos and reproductive plot maps)		\$0.8
Contractual Total	\$0.0	\$54.8
1994 Peer Review Draft Project Number: 94039 Project Title: Common Murre Population Monitoring Agency: Dept. of Interior, Fish & Wildlife Service		FORM 2B PROJECT DETAIL

Comr	modities:		Reprt/Intrm	Remaining
	Food for 2 remote field camps for 6 people Fuel (kerosene, outboard gas & oil, blazo) Other field supplies (e.g., ropes, webbing, r waterproof bags, tents, emergency signalin Office supplies (e.g., photo sleeves, clipboard	for 90 days @ \$11.00/day/person (540 person days x \$11.00 = \$6.0K)* bitons, batteries, rubber boots, maps, notebooks, film, tarps, storage containers, g devices, fuel filters, replacement rain gear) rds, data forms)		\$6.0 \$1.2 \$3.5 \$0.5
	* [Note: Food is purchased in bulk in Home "camp rate".]	r and is supplied to employees at field camps. Employees are not paid a		
	[Note: FWS will supply other camping and	office supplies.)		
l		Commodities Total	\$0.0	\$11.2
Equip	pment:			
	1 inflatable raft (16 ft. heavy duty Achilles ty 1 winch assembly (to assist launching and r 2 pairs of Lietz binoculars 1 mooring system assembly	be) to replace an existing raft ecovering small boats off of steep beaches)		\$6.0 \$0.5 \$1.5 \$1.0
	Upgrade/ replace computer equipment (pur purchase 1 laptop computer for field work to	chase 1 syquest 44/88MB cartridge hard drive and 2 syquest 88MB cartridges; preplace computer acquired in 1989)		\$2.5
	Equipment repairs/cleaning (includes check radios, inflatable rafts, and outboard engine	ting, cleaning and repairing, as necessary, binoculars, spotting scopes, cameras, s)		\$2.5
	[Note: FWS will supply other necessary eq	uipment, including outboard engine s, rafts, radios, and tents.]		
L		Equipment Total	\$0.0	\$14.0
r	07/14/93	Project Number: 94039	ŗ	EOBM 28
	1994 Peer Heview Draft Printed: 02/25/94 11:30 AM Page 17 of 17	Project Title: Common Murre Population Monitoring Agency: Dept. of Interior, Fish & Wildlife Service		PROJECT

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EXXON VALDEZ TRUSTEE COUNCIL FY 94 DETAILED PROJECT DESCRIPTION

A. COVER PAGE

Project title: Introduced Predator Removal from Islands Project ID number: 94041 Project type: General Restoration Name of project leader(s): Edgar P. Bailey Lead agency: DOI-FWS Cooperating agencies: None Cost of project/FY 94: \$84.0K Cost of project/FY 95: \$20.4K Cost of Project/FY 95 and beyond: \$80.0K Project Start-up/Completion Dates: 1 February 1994/1 April 1995 Geographic area of project: Field work will be conducted on Simeonof and Chernabura islands in the Shumigan Islands, western Gulf of Alaska, and data will be analyzed at the DOI-FWS Alaska Maritime National Wildlife Refuge office, 2355 Kachemak Bay Dr. (Suite 101), Homer, Alaska 99603-8021

Project Leader:

Elga P

Edgar P. Bailey, Wildlife Biologist, DOI-FWS (Alaska Maritime NWR)

Project Manager: <u>S. Vernon Bynd</u>

G. Vernon Byrd, Wildlife Biologist, DOI-FWS (Alaska Maritime NWR)

Date: 3/19/94

____ Date: March 19, 1994

B. INTRODUCTION

Black oystercatchers (*Haematopus bachmani*), murres (*Uria spp.*), and pigeon guillemots (*Cepphus columba*) were injured by the T/V *Exxon Valdez* oil spill (Piatt *et al.* 1990, Andres 1993, Oakley and Kuletz in press). Few options are available for direct restoration of injured populations in Prince William Sound, but it is possible to take action to cause populations to expand at the western edge of the area affected by oil by removing introduced foxes from islands where they have kept numbers of oystercatchers and guillemots depressed. Both these species are common on fox-free islands with appropriate nesting habitat in the Shumagins (Bailey 1978, Day 1977, Bailey and McCargo 1984), and local breeding populations of both species, particularly oystercatchers, should increase considerably following the annihilation of foxes.

C. PROJECT DESCRIPTION

Project No. 94041 is designed to restore populations of black oystercatchers and pigeon guillemots at two islands in the Shumagin Island group (Figure 1), located at the downstream edge of the trajectory of the oil spilled by the T/V *Exxon Valdez*. Populations will be enhanced by removing introduced arctic foxes (*Alopex lagopus*) from Simeonof and Chernabura islands. The response of oystercatcher and guillemot populations to fox removal will be monitored.

1. Resources and/or Associated Services:

Black oystercatchers and pigeon guillemots are the injured species that will benefit from removing introduced foxes from Simeonof and Chernabura islands. The work will benefit not only these two species but other insular birds such as puffins, stormpetrels, gulls, terns, and auklets. Because of differences in available habitat, black oystercatcher populations will likely sustain larger increases on Simeonof than on Chernabura, and the opposite would be true for pigeon guillemots.

2. Relation to Other Damage Assessment/Restoration Work:

Assessment studies - other related studies on oystercatchers and guillemots include: (a) Black Oystercatcher Interaction With Intertidal Communities in Prince William Sound (Project 94020) and (b) Pigeon Guillemot Recovery Monitoring in Prince William Sound (Project 94173).

3. Objectives:

The purpose of this project is to enhance populations of black oystercatchers and pigeon guillemots at Simeonof and Chernabura islands by eliminating introduced arctic foxes. Populations of oystercatchers and guillemots will be monitored to document increases following fox removal.

4. Methods:



In May 1994 a Fish and Wildlife Service crew consisting of six individuals will establish camps for about a month on Simeonof Island and another month on Chernabura Island to eradicate foxes with firearms and leg-hold traps. Trapping will first be done on Simeonof, and operations will move to Chernabura after no further fox sign remains on Simeonof. Methods like those employed at other sites in southwestern Alaska will be used (Bailey 1993). There probably are fewer than 30 adult arctic foxes on each island. Trapped foxes will be left in the field for scavengers, mainly eagles and ravens. Trap lines will continue to be checked until no fox sign remains. It will be necessary to check the islands briefly in 1995 to be certain that no animals survived.

b. Oystercatcher and Guillemot Surveys

The size of breeding populations and the extent of potential nesting habitat of oystercatchers and guillemots will be estimated on Simeonof, Chernabura, and two nearby fox-free "control" sites (Bird I. and Atkins/Herendeen Is.). Plans are to make similar observations in 1995 to document the response of these injured species following fox removal.

1. Oystercatcher Habitat Mapping

Since black oystercatchers nest on both rocky and sand beaches, all beaches on study islands will be divided into segments separated by natural features (e.g., cliffs, streams, substrate changes). Segments will be delineated on maps and aerial photographs, and each segment will be described (length, average width, substrate, etc.).

2. Oystercatcher Counts

Black oystercatchers will be counted by a two-person team cruising the perimeter of each island in an inflatable boat within 30 m of shore during June (the incubation period; Kenyon 1964, Day 1977). This is the period when pairs are territorial and most conspicuous. The best time to count oystercatchers is from approximately 2 hours before low tide until an hour after low tide, the period when they are most actively foraging (Andres 1993). For each oystercatcher observation, the location (beach segment code--see above) and status (single, pair, or larger group) will be recorded. Beaches where singles or pairs are noted will be checked on foot to determine whether nests are present. All areas will be surveyed at least three times to reduce chances of missing territorial birds.

3. Guillemot Habitat Mapping

Pigeon guillemots nest in rock cavities along boulder beaches, in cliff crevices, in drift

log piles, or occasionally in burrows, especially in close proximity to shallow waters for foraging (Ewins 1993, Sanger and Cody 1993, Drent 1965). Due to this diversity of habitat types it will be difficult to map all possible nesting areas for guillemots, but attempts will be made to delineate the surface areas of talus areas and substantial drift log piles that provide typical guillemot nest sites. In addition, areas of sea cliffs with crevices that could be used by guillemots will be mapped and described. Forms like those used by Sanger and Cody (1993) will be employed to document colony data.

4. Guillemot Counts

Reports in the literature provide differing views on the best time to count guillemots. The relative influence of tide stage, time of day, and time of the breeding season on attendance of guillemots at breeding colonies apparently varies among areas (e.g. California, Ainley and Boekelheide 1990; British Columbia, Drent 1965, Vermeer et al. 1993; and Prince William Sound, Sanger and Cody 1993). For our objective of estimating the average number of guillemots present at colonies during the incubation period for comparison among sites and years, it appears the optimum time to census breeding pigeon guillemots is morning hours during the incubation period (about mid-June to mid-July, Day 1977) and within several hours of high tide. Although peak numbers of guillemots occurred at Prince William Sound colonies during the pre-laying period (Sanger and Cody 1993), Vermeer et al. (1993) recommend counts between egg-laying and early chick stages, when numbers are least variable. Hence, we will inventory guillemots during incubation. This period also offers a much longer period of time in which to make counts. Due to hourly and daily variation in attendance of quillemots at colonies, at least four replicate surveys will be made to estimate guillemot populations.

Counts will be conducted by two individuals slowly circumnavigating islands in an inflatable about 50 m offshore during periods of good visibility and relatively calm seas. All guillemots within approximately 100 m of shore will be recorded. Island coastlines will be subdivided into segments based on natural features, and counts will be recorded within each segment. Concentrations of four or more birds on the water or land near guillemot nesting habitat will be delineated as accurately as possible on maps during at least the first two surveys. If there are substantial differences, concentrations will be delineated on subsequent surveys as well.

5. Data Analysis

Because of variable widths of nesting habitat along shorelines, numbers of oystercatchers and guillemots will be expressed as densities (birds per km of shoreline, or birds per km² of talus or log pile habitat). Analysis of variance will be used to test for differences among sites and years.



c. Alternatives

There are no other alternatives that would so effectively enhance guillemot and oystercatcher populations. Methods for monitoring injured species are comparable to those used by others engaged in this type of study, namely studies in Prince William Sound pertaining to oystercatchers (Andres, B.A. 1993), and to guillemots (Sanger, G.A. and M.B. Cody 1993).

5. Location:

The restoration program will be conducted at Simeonof and Chernabura islands in the Shumagin group, south of the Alaska Peninsula (Figure 1), near the western edge of the trajectory of the oil spilled by the *T/V Exxon Valdez*. These islands are 100 km southeast of the community of Sand Point, but no communities will be affected by the project. The islands are within the Alaska Maritime National Wildlife Refuge.

6. Technical Support:

This project does not require technical support.

7. Contracts:

No contracts will be used during this project.

8. Literature Cited:

- Ainley, D.G. and R.J. Boekelheide. 1990. Seabirds of the Farallon Islands. Stanford University Press, Stanford, CA.
- Andres, B.A. 1993. Potential impacts of oiled mussel beds on higher organisms: black oystercatchers. Unpublished report, U.S. Fish and Wildlife Service, Anchorage, AK.
- Bailey, E.P. 1978. Breeding seabird distribution and abundance in the Shumagin Islands, Alaska. Murrelet 59:82-91.
- Bailey, E.P. and D. McCargo 1984. Eradication of fox on Bird Island and incidental surveys of seabirds in the Shumagin Islands, Alaska. Unpublished report. U.S. Fish and Wildlife Service, Homer, AK.
- Bailey, E.P. 1993. Introduction of foxes to Alaskan Islands--history, effects on avifauna, and eradication. U.S. Department of the Interior, Fish and Wildlife Service Resource Publication 193.

Day, R.A. 1977. Birds of the Shumagin Islands, with special emphasis on the Koniuji Group. Unpublished report. U.S. Fish and Wildlife Service, Anchorage, AK.



- Drent, R.H. 1965. Breeding biology of the pigeon guillemot *Cepphus columba*. Ardea 53:99-160.
- Ewins, P.J. 1993. Pigeon guillemot (*Cepphus columba*). In The Birds of North America, no. 49 (A. Poole and F. Gill, Eds.). Philadelphia: The Academy of Natural Sciences; Washington D.C. : The American Ornithologist's Union.
- Kenyon, K.W. 1964. Wildlife and historical notes on Simeonof Island, Alaska. Murrelet 45:1-8.
- Oakley, K., and Kuletz. ms. Population, reproduction, and foraging ecology of pigeon guillemots at Naked Island, Prince William Sound, Alaska, before and after the *T/V Exxon Valdez* oil spill. Bird study number 9. Final Report. U.S. Fish and Wildlife Service, Migratory Bird Management, Anchorage, AK.
- Piatt, J., C.J. Lensink, W. Butter, M. Kendziorek, and D.R. Nysewander. 1990. Immediate impact of the *T/V Exxon Valdez* oil spill on marine birds. Auk 107: 387-397.
- Sanger, G.A. and M.B. Cody. Survey of pigeon guillemot colonies in Prince William Sound, Alaska. Unpublished report, U.S. Fish and Wildlife Service, Anchorage, AK.
- Vermeer, K., K.H. Morgan and G.E.J. Smith. 1993. Colony attendance of pigeon guillemots as related to tide height and time of day. Colonial Waterbirds 16:1-8.

D. SCHEDULES

1. FY94 Milestones

- Mar 94 Complete study plan, procure equipment, and select temporary field personnel.
- <u>Apr 94</u> Continue procurement of equipment and supplies.
- May 94 Organize and pack supplies, train field personnel, depart for Shumagin Islands and establish camps on Simeonof Island about May 22.
- <u>Jun 94</u> Eradicate foxes on Simeonof Island and move to Chernabura Island to commence removal operations there. Conduct surveys for oystercatchers and guillemots on these two islands along with nearby "control" islands (Bird, Atkins, and Herendeen). High tides during morning hours, when guillemots should be monitored, will occur on 15 days in June and early July, the incubation period when guillemots should be censused.
- <u>Jul 94</u> Leave Chernabura Island mid-month and return to Homer.

Aug-Sep 94 Clean and store equipment and supplies.

2. FY95 Milestones

Oct-Dec 94 Analyze data and write report.

Jan-Apr 95 Draft report to Oil Spill Coordinator 15 March and final report to Chief Scientist 15 April.

3. Project Personnel

G. Vernon Byrd: Project manager supervises planning, training, data analysis, and completion of report.

E.P. Bailey: Project leader oversees all aspects of field work. In addition, three biological technicians and two volunteers will assist in field operations. Two of the technicians will be responsible for conducting surveys of guillemots and oystercatchers and analyzing data; one will be largely responsible for compiling the report on monitoring these two species.

4. Logistics

Field camps will be periodically on Simeonof, Chernabura, Bird, and possibly Little. Koniuji islands (base of operations for surveys of Atkins and Herendeen islands).

E. EXISTING AGENCY PROGRAM

The DOI-FWS Alaska Maritime NWR has an existing program for removal of introduced foxes from islands for restoration of threatened Aleutian Canada geese, seabirds, and other native species. However, this program for restoration of seabirds on islands south of the Alaska Peninsula has had little funding. For example, in 1993 only \$8000 was alloted, making it difficult to accomplish the task.

F. ENVIRONMENTAL COMPLIANCE/PERMIT/COORDINATION STATUS

The removal of alien foxes by trapping and shooting from refuge islands was sanctioned by an environmental assessment in I985 (Environmental Assessment--Proposed Eradication of Introduced Fox on Alaskan Islands. Alaska Maritime National Wildlife Refuge, Alaska. U.S. Fish and Wildlife Service, Homer, Alaska). No additional approvals or permits are required.

G. PERFORMANCE MONITORING

1. Backup strategy

This project will be monitored by the project manager who is the refuge supervisory

wildlife biologist stationed in Homer. If the project leader or biological technicians leave before completion of the project, the project manager will find suitable replacements and assure the quality and timely submission of reports.

2. Quality assurance and control plan

Project quality will be insured by:

a. Using experienced personnel to eradicate foxes and monitor populations of guillemots and oystercatchers.

b. Following accepted, standardized procedures for counting guillemots and oystercatchers.

3. List of products

A report on accomplishments in the summer of 1994 will be written by December 1994. A final report verifying the removal of all foxes from Simeonof and Chernabura islands and resurveys of guillemot and oystercatcher populations on these two islands along with the three previously mentioned fox-free islands used as controls will be completed by December 1995.

H. COORDINATION OF INTEGRATED RESEARCH EFFORT

Project 94041 is being coordinated with other monitoring studies underway for guillemots and oystercatchers in Prince William Sound to insure current methods are applied.

I. PUBLIC PROCESS

The public has been apprised of the devastating ecological consequences from introduced foxes on Alaskan islands in various scientific publications and popular literature, such as a recent article in "Alaska Geographic." Several conservation groups have encouraged the Fish and Wildlife Service to expend more effort in the removal of exotic species on the refuge to restore breeding seabirds, especially those species injured by the oil spill. This proposal has been reviewed by the Exxon Valdez Oil Spill Public Advisory Group, and the public had the opportunity to comment on this project at the January 1994 Trustee Council meeting.

J. PERSONNEL QUALIFICATIONS

Both the project manager, G.V. Byrd, and the project leader, E.P. Bailey, are well qualified to undertake the proposed action. Brief resumes follow:

1. Project Manager - G. Vernon Byrd

G. Vernon Byrd received a B.S. degree in wildlife management from the University of Georgia in 1968, did post-graduate studies in wildlife biology at the University of Alaska Fairbanks in 1975, and completed a M.S. degree in wildlife resources management (with an emphasis in applied statistics) from the University of Idaho in 1989. Thesis research was on kittiwakes (*Rissa* spp.) and murres (*Uria* spp.) in the Pribilof Islands. Mr. Byrd has worked for the U.S. Fish and Wildlife Service for over 20 years, focusing on studies of marine birds in Alaska and Hawaii. His major interests have centered around monitoring long-term trends in seabird populations, including numbers of birds and reproductive performance at colonies. He has written over 40 scientific papers and 50 U.S. Fish and Wildlife Service reports on field studies, and he has presented over 15 papers on seabirds at scientific meetings. Mr. Byrd currently serves as supervisory wildlife biologist at the Alaska Maritime National Wildlife Refuge, the premier area for seabirds in the national public land system.

Selected Publications

Byrd, G.V., E.C. Murphy, G.W. Kaiser, A.J. Kondratyev, and Y.V. Shibaev. (In press). Status and ecology of offshore fish-feeding alcids (murres and puffins) in the North Pacific Ocean. Proceedings of "Symposium on the Status, Ecology, and Conservation of Marine Birds of the Temperate North Pacific". Canadian Wildlife Service, Ottawa.

Springer, A.M. and G.V. Byrd. 1989. Seabird dependence on walleye pollock in the southeastern Bering Sea. Pages 667-677 in Proceedings of the International Symposium on the Biology and Management of Walleye Pollock. Alaska Sea Grant Rep. No. 89-1, University of Alaska, Fairbanks.

Day, R.H. and G.V. Byrd. 1989. Food habits of the whiskered auklet at Buldir Island, Alaska. Condor 91:65-72.

Byrd, G.V., J.L. Sincock, T.C. Teffer, D.I. Moriarty, and B.G. Brady. 1984. A cross lostering experiment with Newell's race of Manx shearwater. J. Wildl. Manage. 48:163-168.

Byrd, G.V., D.I. Moriarty, and B.G. Brady. 1983. Breeding biology of wedge-tailed shearwaters at Kilauea Point, Hawaii. Condor 85:292-296.

2. Project Leader - Edgar P. Bailey

Edgar P. Bailey obtained a B.S. degree in biology from the University of Redlands in California and spent an additional 3 years at Utah State University, receiving a M.S. degree in wildlife biology in 1963. He has worked for Federal resource agencies for over 30 years, including the Forest Service, National Park Service, and the Fish and Wildlife Service. He came to Alaska 25 years ago as assistant manager for the former Aleutian Islands National Wildlife Refuge, and during this period he has been continuously involved with marine birds and mammals, specializing on the adverse effects of alien species on island biodiversity and particularly the need to remove introduced foxes from refuge islands. He has published more than 20 papers in various journals and has written numerous unpublished reports. He has thousands of hours of experience operating inflatables and other small boats primarily south of the Alaska and Kenai peninsulas and in the Aleutians.

Selected publications pertaining to alien species and seabirds on islands south of the Alaska Peninsula

Bailey, E.P. 1993. Introduction of foxes on Alaskan islands-history, effects on avifauna, and eradication. U.S. Department of the Interior, Fish and Wildlife Service. Resource Publication 193: 54 pp.

Bailey, E.P. and G.W. Kaiser. 1993. Impacts of introduced predators on nesting seabirds in the northeast Pacific. Pages 218-226



in Vermeer, K., K.T. Briggs, K.H. Morgan, D. Siegel-Causey (eds.). The status, ecology, and conservation of marine birds of the North Pacific. Canadian Wildlife Special publication, Ottawa.

- Bailey, E.P. 1992. Red foxes (Vulpes) as biological control agents against arctic foxes (Alopex lagopus), on Alaskan Islands. Canadian Field Naturalist 106:200-205.
- Bailey, E.P. and N.H. Faust. 1984. Summer distribution and abundance of marine birds and mammals off the coast of the Alaska Peninsula between Amber and Kamishak bays. Western Birds 15:16H74.
- Bailey, E.P. and N.H. Faust. 1981. Summer distribution and abundance of marine birds and mammals between Mitrofania and Sutwik islands south of the Alaska Peninsula. Murrelet 62: 34-42.
- Bailey, E.P. and N.H. Faust. 1980. Summer distribution and abundance of marine birds and mammals in the Sandman Reefs, Alaska. Murrelet 6I:649.

Bailey, E.P. 1978. Breeding seabird distribution and abundance in the Shumagin Islands, Alaska. Murrelet 59:82-91.

K. BUDGET

Estimated cost breakdowns for this \$84.0K project are attached (Forms 2A and 2B).



Figure 1. The Shumagin Islands, Alaska Project 94041 study area.

Project Description: This project is designed to restore populations of oystercatchers and pigeon guillemots by removing introduced foxes from Simeonof and and Chernabura islands in the western Gulf of Alaska.

Budget Category	1993 Project No. (None) Authorized FY93	'93 Report/ '94 Interim* FFY 94	Remaining Cost** FFY 94	Total FFY 94	FFY 95	Comment
Personnel Travel Contractual Commodities Equipment Capital Outlay Subtotal General Administration Project Total Full-time Equivalents (FTE)	\$0.0 \$0.0 \$0.0 \$0.0 \$0.0 \$0.0 \$0.0 \$0.0	\$0.0 \$0.0 \$0.0 \$0.0 \$0.0 \$0.0 \$0.0 \$0.0	\$24.0 \$17.0 \$0.0 \$13.2 \$26.2 \$0.0 \$80.4 \$3.6 \$84.0 1.0	\$24.0 \$17.0 \$0.0 \$13.2 \$26.2 \$0.0 \$80.4 \$3.6 \$84.0 1.0	\$16.0 \$1.0 \$0.0 \$1.0 \$0.0 \$0.0 \$18.0 \$2.4 \$20.4 0.8	[Note: The target islands are remote & not inhabited by people. Successful removal of foxes requires trained experienced crews familiar with these environments & familiar with methods for eradicating foxes. Con- tracting in not a viable option because of the difficulty in finding experienced personnel available for this type of work at this time of year & because of logistical costs (the FWS vessel Tiglax normally travels these waters & this will help minimize logistical costs).
	Dollar	amounts are s	hown in thousa	ands of dollars.		
Budget Year Proposed Person Position Description	nel:	Reprt/Intrim Months	Reprt/Intrim Cost	Remaining Months	Remaining Cost	
Program Manager, GS-12 Project Manager, GS-12 Project Leader, GS-11 3 Temporary Biologists, GS-5				(1.0)* (1.0)* (6.0)* 12.0	\$0.0 \$0.0 \$0.0 \$24.0	• [Note: In both FY94 & FY95, the services of the GS-12 Program Manager, the GS-12 Project Manager, & the GS-11 Project Leader will be provided by DOI-FWS at no cost to the project.]
						NEPA Cost: \$0.0
07/14/93	Personnel Total	0.0	\$0.0	12.0	\$24.0	*Oct 1, 1993 - Jan 31, 1994 **Feb 1, 1994 - Sep 30, 1994
1994 Peer Rev Printed: 03/1	view Draft Pr	oject Numbe oject Title: I	er: 94041 ntroduced F	redator Rer	noval from	Islands FORM 2A



Travel:	Reprt/Intrm	Remaining
2 days of ship time on M/V Tiglax @ \$3.0K/day		\$6.0
6 trips from Sand Point to Homer plus per diem (6 trips @ \$650.00/trip +18 days per diem @ \$115.00/day)		\$6.0
1 trip from Homer to King Salmon (1 trip @370.00/trip + 2 days per diem @ \$115.00.day)		\$0.6
1 round trip Minnesota- Homer-Minnesota for volunteer (1 trip @ \$1.0K/trip)		\$1.0
Aircraft charter from King Salmon to Simeonof Island (1 trip @ flat rate of \$1.5K)		\$1.5
Per diem for field personnel and 1 person detailed to Homer from Adak office (per diem for field personnel is calculated at \$3.00/day x 360 person days = \$1.1K-this token daily amount must be paid to all FWS employees and non-SCA volunteer for each day spent in the field; per diem for Homer detail is calculated at \$40.00/day for 20 days = \$0.8K)	\$	\$1.9
Travel Tot	si \$0.0	\$17.0
Contractual:		
[No contracts are required for this project.]		
Contractual To	al \$0.0	\$0.0
1994 Peer Review Draft Printed: 03/16/94 2:30 PM Page 13 of 14 Project Number: 94041 Project Title: Introduced Predator Removal from Islands Agency: Dept. of Interior, Fish & Wildlife Service		FORM 2B PROJECT DETAIL

Commodities:	Reprt/Intrm	Remaining
Food for field camps for 6 people for 70 days @ \$14.00/day/person (420 person days x \$14.00/day = \$5.9K)		\$5.9
Fuel (kerosene, gas and oil for outboard engines, blazo)		\$2.0
Office and other field data recording supplies (e.g., notebooks, tally counters, maps)		\$0.3
Camping supplies (e.g., rain gear, rubber boots, float-coats, gloves, waterproof bags, sleeping pads, rope, tarps)		\$1.0
Trapping supplies (survey tape, trapping baskets, stakes, lures/bait, ammunition, & 500 traps @ \$5.00 each)		\$4.0
Commodities Total	\$0.0	\$13.2
3 weatherport shelters @ \$1.35K each (3 x \$1.35K = \$4.0K) 1 heavy duty inflatable boat (16 ft) 2 outboard engines (30 hp) @ \$4.6K each (2 x \$4.6 K = \$9.2 K) 1 SSB radio 1 radio antenna Camping equipment (e.g., stoves, air-rollers, pocket compasses, barometers) 2 rifles @ \$400.00 each (2 x \$400.00 = \$0.8K) 1 hand-held GPS [Note: FWS will supply other necessary equipment, including a back-up outboard engine, additional radio equipment (e.g., hand-held radios & back-up radios), & other camping & trapping equipment.]		\$4.0 \$5.5 \$9.2 \$3.5 \$0.5 \$1.7 \$0.8 \$1.0
Equipment Total	\$0.0	\$26.2
1994 Peer Review Draft Printed: 03/16/94 2:30 PM Page 14 of 14 Project Number: 94041 Project Number: 94041 Project Title: Introduced Predator Removal from Islands Agency: Dept. of Interior, Fish & Wildlife Service		FORM 2B PROJECT DETAIL

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DETAILED PROJECT DESCRIPTION UNDER PREPARATION FOR THIS PROJECT
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DETAILED RESTORATION PROJECT DESCRIPTION

1. Project Title: Habitat Use, Behavior, and Monitoring of Harbor Seals in Prince William Sound

2. Project ID #: 94064

3. Project Type: Marine Mammals Research/Monitoring

4. Project Leader: Kathryn J. Frost

5. Lead Agency: Alaska Department of Fish and Game

Cooperating Agencies: National Marine Mammal Laboratory/NMFS/NOAA

Other Cooperating Parties: University of Alaska, Texas A & M University

6. Project Cost: SFY 94 (October 1993-September 1994) \$236,600 SFY 95 (October 1994-September 1995) \$260,000 SFY 96 (October 1995-September 1996) \$120,000

mph R. Sullin

7. Start Date: 1 February 1994

Completion date: 30 September 1996

8. Geographic Area of Project: Prince William Sound

9. Project Leader Signature:

Kathryn J.

10. Project Manager:

Name:

Signature:

B. INTRODUCTION

Harbor seals (Phoca vitulina richardsi) occur year-round in PWS, where they are commonly seen hauled out on rocks, reefs, beaches, and glacial ice. They pup, breed, molt, and feed in the Sound. During extensive surveys of PWS in 1991, approximately 2,500 harbor seals were counted on haulouts (Loughlin 1992). Another 1,700 were counted in the Copper River Delta and Orca Inlet. These counts are minimum estimates of the population in this region, since some seals were in the water and not available for counting during surveys and some haulouts were not surveyed.

From 1984-1988, harbor seal counts at 25 trend sites in PWS declined by 43%, or an average annual rate of 13%, for unknown causes (Pitcher 1989). The decline continued in 1989, exacerbated in oiled areas by the Exxon Valdez oil spill (EVOS); 1989 counts of harbor seals at oiled trend count sites declined by 45%, compared to 11% at unoiled sites (Frost and Lowry 1993). Since 1989, counts for the PWS trend count area as a whole have remained approximately the same, and are currently 27% lower than they were in 1988. Counts at oiled sites are still proportionately lower than counts at unoiled sites. Counts during pupping have continued to decline.

It is likely that more than 300 harbor seals were killed by the EVOS in PWS (Frost and Lowry 1993). Seals encountered oil in the water and on haulouts. Behavior of many oiled seals was abnormal following the EVOS, with seals reported to be sick and lethargic. Severe debilitating lesions were found in the brain of a heavily oiled seal collected in Herring Bay 36 days after the EVOS. Similar but milder lesions were found in other seals found dead and in seals collected three or more months after the spill. Neonatal pup mortality was abnormally high in the year of oil spill, but apparently returned to normal in 1990-1992.

Harbor seals are important to residents of PWS for subsistence. They are harvested by communities such as Tatitlek, Chenega, and Cordova. In 1987-1989, they made up 13%-19% of the total harvest of subsistence foods in Tatitlek. In Chenega Bay in 1985-1986, harbor seals accounted for 27% of the total pounds harvested. During 1992, approximately 330 harbor seals were harvested in PWS (Wolfe and Mishler 1993). Harbor seals are also watched and photographed by tourists and recreational users of PWS and they interact with and are incidentally killed by commercial fisheries. Like all marine mammals, are have special federal protection under the Marine Mammal Protection Act. If the current decline continues or if up-to-date population data are not available, harbor seals could be placed in a more restrictive legal classification.

Because of the ongoing decline in harbor seal abundance, which was exacerbated in the area impacted by the EVOS, it is particularly important to understand what factors are limiting the harbor seal population. We cannot assume, given the recent decline and the lack



of recovery in the oiled area, that the number of seals in oiled areas will return naturally to pre-spill levels. It is necessary both to continue monitoring population trends and to identify and appropriately manage areas of particular biological significance in order to augment recovery in any way possible.

Most of the information currently available on harbor seals in PWS consists of counts of animals on haulouts during pupping and molting. While these data are essential for monitoring changes in overall abundance, they are not adequate for determining what is causing the seal population to decline, or for designing conservation and management measures to facilitate recovery and ensure the future health of the population. There is no information available on site fidelity, movements between haulout sites, seasonal changes in hauling out patterns, habitats used for feeding, or feeding behavior.

Recently developed satellite-linked telemetry can be used to gather information on all of these important aspects of harbor seal biology. Miniature platform transmitter terminals (PTTs) have created opportunities to monitor location and diving behavior of marine mammals (Mate 1986, 1989; Hill et al. 1987; Stewart et al. 1989; R. Merrick personal communication, Frost 1991). The PTTs transmit to a satellite-based Doppler positioning system that calculates locations and tracks movements of animals with considerable accuracy. When combined with appropriate environmental sensors and microprocessor hardware and software, other information about an animal's environment and behavior can be transmitted to the satellite.

A pilot study conducted in 1991-1992 demonstrated the feasibility of attaching satellite transmitters to harbor seals in PWS. Seals were captured by entangling them in specially constructed nets set near haulouts. PTTs were attached to three seals at Seal Island, one in Herring Bay, and four at Applegate Rocks. Data were received for 3 to 68 days and provided numerous locations and depth of dive histograms. Seals tagged at Seal Island in spring remained near there throughout most of the summer, based on PTT locations, VHF transmitter signals, and visual observations. The seal tagged at Seal Island in September transmitted data for only three days. The seal that was tagged in Herring Bay left that area and swam at least 100 km to spend seven days near the Yale Glacier in College Fiord. It then returned to Herring Bay. Tags of the four seals tagged at Applegate Rocks transmitted for 51-68 days; two seals made local movements in central PWS and two travelled to the Copper River Delta, later returning to PWS. Data on depth of dives indicated that some harbor seals in PWS make dives deeper than 250 m, and therefore may do much of their feeding on the bottom. Dives of one seal were mostly 51-150 m.

Additional PTTs were attached to 12 harbor seals in 1993: nine at Seal Island, and one each at Applegate Rocks, Bay of Isles, and Channel Island. Six were deployed in May and transmitted for 38-78 days. One of these moved back and forth between central PWS and College Fiord. One made a short trip to the Columbia Glacier and

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spent the rest of the time in the central sound. Two other seals made trips to the Gulf of Alaska, then returned to central PWS. All six spring seals were near the site where they were tagged as molt approached and the PTTs fell off. Six additional seals were tagged in September. One PTT failed after 101 days and the other five were still transmitting on 1 February 1994, 135-138 days after they were attached. Five of the six tagged seals did not move far from the location where they were tagged. One tagged at Seal Island made multiple trips to the Columbia Glacier, and also visited Lone and Perry islands.

The goals of this study are to gather data on the behavior and habitat use of harbor seals in PWS that can be used to design effective conservation measures, and to monitor the abundance and trends of harbor seals at trend count sites in oiled and unoiled areas of PWS using standardized methodology. Habitat use and behavior studies will be conducted by attaching satellite transmitters to harbor seals at selected sites, and determining their movements, diving patterns, feeding locations, and haulout patterns. Population monitoring will be conducted by flying aerial surveys of the trend count route during the autumn molt. Counts will be compared to data collected prior to and during the EVOS in order to document whether and how rapidly natural recovery occurs.

C. PROJECT DESCRIPTION

1. Resources

This study will investigate harbor seals in PWS. Information derived from this study may benefit subsistence hunters, salmon fishermen, tourist operators, and the general public who are interested in and concerned about harbor seals.

2. Relation to Other Work: This proposed study is a continuation of harbor seal NRDA and Restoration studies funded by the Trustee Council in 1989-1993. Methodology is consistent with that used in previous studies. This study is designed to incorporate and build on data obtained in previous years and to address questions raised by earlier studies.

3. Objectives

The objectives of this study are:

 to monitor harbor seal population trends in PWS by conducting aerial surveys at 25 trend count sites during pupping and molting in 1994 and 1995;

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 to compare data from 1994 and 1995 surveys to data collected following the EVOS to determine whether seals are recovering to pre-spill levels;

- 3. to describe the hauling out and diving behavior, and by inference, feeding behavior of satellite-tagged seals in PWS relative to date, time of day, and tide;
- to describe the use of and frequency of movements between haulouts; and
- 5. to determine movement patterns within PWS and between PWS and adjacent areas.

4. Methods

We are proposing two additional years of field study (1994, 1995) with final data analysis and reporting to take place in year three. The study will have two components: aerial surveys to monitor abundance and satellite-tagging to study movements, habitat use, and behavior.

a. Monitoring

We plan to conduct aerial surveys of harbor seals in PWS during pupping in June and molting in late August/September to determine whether harbor seals have recovered from the decline caused by the EVOS and to monitor the trend in the population. Surveys will follow a trend count route previously established by ADF&G (Calkins and Pitcher 1984; Pitcher 1986, 1989, Frost and Lowry 1993). The trend count route covers 25 haulout sites and includes seven sites that were impacted by the EVOS (Agnes, Storey, Little Smith, Big Smith, Seal, and Green islands, and Applegate Rocks) and 18 unoiled sites (Table 1). Several surveys will also be conducted of seals in the Copper River Delta to gain understanding of the relationship between seal counts in PWS and the Delta. The survey methodology and observers will be the same as those used in NRDA studies conducted in 1989-1991 (see Frost and Lowry 1993), and as summarized below.

In order to conduct surveys at a time when a relatively large and consistent proportion of the population is hauled out and can be counted, it is necessary to consider factors such as weather, seasonal behavior patterns, tidal stage, and disturbances. Maximum numbers of harbor seals are known to haul out during pupping and molting (Pitcher and Calkins 1979; Calambokidis et al. 1987). Within these periods, more animals are usually hauled out at lower stages of the tide, since availability of most haulout sites is limited by tidal stage. Consequently, our surveys will be conducted during June (pupping) and late August/September (molting) and will begin within two hours before daylight low tides and finish within two hours after low tide. We will attempt to survey each site 7-10 times during a survey period to reduce statistical variance of the counts. Sample size for aerial surveys is partly determined by weather which can limit flight altitudes. While results of previous harbor seal trend counts have indicated that it is desirable to obtain 7-10 counts during a survey period (Pitcher 1986, 1989), in actuality the number of counts is almost always limited by the number of days within the molting period

that are suitable for flying.

Surveys will be conducted from a single engine fixed-wing aircraft (Cessna 180 or 185) on floats. Haulout sites will be flown over at an altitude of 200-300 m. Visual counts will be made of seals at each site, usually with the aid of 7 power binoculars. Pups will be counted separately during June. Photographs will be taken of large groups for later verification using a hand held 35-mm camera with 70-210 mm zoom lens and high speed film (ASA 400). Color slides will be commercially developed and the seals will be counted from images projected onto a white surface.

Aerial surveys do not estimate the total number of seals present since they do not account for seals that are in the water or seals hauled out at locations not on the trend count route. Surveys provide indices of abundance based on the number of hauled out seals that is counted. Interpretation of trend count surveys relies on the assumption that counts of harbor seals on select haulout sites are valid linear indices of local abundance. We assume that within a given biological window, such as the molting period, hauling out behavior remains the same from one year to the next, and counts can thus be compared. Standardization of procedures minimizes the affects of variables such as tide and weather that could influence the number of seals hauled out on a given day. Behavioral data obtained from satellite transmitters attached to seals as part of this study will help to verify these assumptions.

Reliable surveys of the trend count route were conducted during the molt in 1984 and 1988-1993. These data will be used for comparisons with data collected in 1994 and later. Analyses of trend count data and comparisons with other years will be conducted following statistical methodology used for previous surveys (Frost and Lowry 1993). Overall trends in abundance during pupping and molting, and trends at oiled versus unoiled sites, will be examined using loglinear and logit-type categorical models (Agresti 1990) with bootstrapping (Efron 1982; Efrom and Tibshirani 1986) applied to the means of the site count data. Contrasts derived from the test hypotheses will be used to compare average counts in oiled and unoiled areas (see Frost and Lowry 1993 for detailed description of contrasts and analyses).

Project investigators will cooperate with personnel from the ADF&G Division of Subsistence in their efforts to involve residents of Chenega Bay and Tatitlek in sampling efforts and harvest monitoring for harbor seals. Investigators will keep others informed of pertinent results of this study. Such an exchange of information will allow biologists to benefit from residents' observations about abundance and behavior of harbor seals in PWS and will help residents to make informed decisions about their annual harvest of harbor seals.

b. Habitat use and behavior

In 1991, we began our investigation of harbor seal habitat use in PWS

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with a pilot study in which four satellite-linked PTTs were attached to seals at Seal Island and Herring Bay. Two seals were caught and instrumented during April 1991 and two others in September 1991. Information obtained from seals tagged in April was used to modify the design and programming of PTTs attached in September. Additional information from seals tagged in September, and from 4 spotted seals tagged with similar PTTs in the Chukchi Sea, was incorporated into the design of PTTs that were deployed in 1992 and 1993. Ten additional PTTs were deployed in May 1992 and 1993; they transmitted from May until mid-July when they fell off due to the annual molt. Six PTTs were attached during September 1993; five are still transmitting.

We propose to attach satellite-linked time-depth recorders (PTTs) to 12 seals per year in 1994 and 1995 at a variety of locations in PWS in order to better evaluate geographical and seasonal differences in movements and behavior. Six seals will be caught in spring, well before pupping, so that mothers with newborn pups are not caught. Six more seals will be tagged in September, after the molt, at a variety of locations. If miniature, 0.25-watt PTTs become available in 1995, an attempt will be made to catch and tag several young seals in order to allow a comparison of their movements and behavior to that of adults. Actual taggging locations will depend on where seals are present and can be caught, but will include sites that represent different habitat types. Locations will be chosen for comparison with the existing data base from Seal Island and Applegate Rocks. Consideration will be given to eastern PWS (Port Gravina and Sheep Bay), northern PWS (College Fiord or Unakwik Inlet), southwestern PWS (Dangerous Passage and Icy Bay), and the Copper River Delta.

Seals will be caught by entanglement in nets placed near the haulouts. Nets will be approximately 100 m long and either 3.7 or 7.4 m deep with standard floats or float line and relatively light lead lines. Mesh openings will be 10-30 cm. Nets will be deployed from a 6 m boat assisted by one or two other small boats to assist in maneuvering the net and tending it to ensure that all captured seals are quickly detected and removed.

When seals become entangled, they will be brought into the boats or to shore, cut free from the tangle net, and placed into hoop nets (large stockings made of 1 cm mesh soft nylon webbing). Smaller seals will be physically restrained during handling and tagging. Larger animals will be sedated with a mixture of ketamine and diazepam administered intramuscularly at standard doses (Geraci et al. 1981). Each seal will be weighed, measured, and tagged in both hindflippers with individually numbered plastic tags. Field personnel will collect approximately 50 cc of blood from the extradural intervertebral vein. Standard blood chemistry panels and virology screens will be run on these samples.

Transmitters (approximately 15 cm x 15 cm x 3 cm, or smaller) will be attached to the mid-dorsal surface of the seal by gluing with epoxy resin (Fedak et al. 1984, Stewart et al. 1989). The PTTs that are

attached in April/May should remain attached until mid-July when they will fall off as the annual molt begins and the hair to which they are glued is shed. PTTs attached in autumn following the molt should remain attached until the next molt. Based on our experience with fall 1993 PTTs, we expect them to transmit 5 or more months.

Data will be acquired from the ARGOS satellite receiving system and analyzed using software provided by the manufacturer of the Each PTT will transmit signals to polar-orbiting transmitters. satellites whenever the seal is hauled out or when it surfaces sufficiently long for transmission to occur. An uplink occurs when a satellite is positioned to receive the signal. Information transmitted by the PTT is used by Service ARGOS to calculate the geographic location of the seal. Units will be equipped with built-in programmable microprocessors to collect and summarize data for periods when animals are diving and store it for later transmission, as has been done for crabeater seals (Lobodon carcinophaqus), Steller sea lions (Eumatopias jubatus), and spotted seals (Phoca largha) (Hill et al. 1987; R. Merrick, personal communication; K. Frost and L.Lowry, unpublished data). These data will be stored in six hour blocks and transmitted to the satellite once the six hour data collection period is complete. Sensor information from a pressure transducer and a conductivity switch will be used to indicate when the animal is hauled out. Data from four periods will be stored in memory, providing at least a 24 hour window for transmission before the data are lost. Dive data will be summarized as histograms in depth bins of 4-20 m. 21-50 m, 51-100 m, 101-150 m, 151-200 m, and over 200 m, and duration bins of 0-120 seconds, 121-240 seconds, 241-360 seconds, 361-480 seconds, 481-600 seconds, and over 600 seconds. In addition, 1994 PTTs will store and transmit the amount of time spent in each depth bin.

Each PTT broadcasts a unique identification code so that data can be assigned to a particular seal. Position accuracy for all geographical locational information is rated by Service ARGOS to reflect the predicted accuracy of the calculated locations (Fancy et al. 1988, Stewart et al. 1989). Data acquired for harbor seals in this study will be screened for accuracy and interpretation of results will take into account signal quality. Sensor data will be used to validate whether the animal was at sea or hauled out on land when data were acquired, since errors in calculated locations may falsely indicate that a seal is on land or at sea (see Stewart et al. 1989).

Data on the haulout patterns of tagged seals will be examined for indications of daily or seasonal variations, for example to determine whether there is a change in the frequency of haulout by season, or whether the amount of time spent hauled out changes. Plots of locations where continuous signals are received will be used to determine the degree and regularity of use of particular haulout sites. We expect to receive fewer locations of seals while at sea, because the transmitter's antenna will frequently be submerged. However, at-sea locations will be plotted as an indication of areas

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used for feeding. Information on depth and pattern of diving will be compiled, and can provide some additional information on the general areas used for feeding.

Locations calculated by Service ARGOS will be screened for accuracy and plotted on charts of PWS. Locational data will be compared with sensor data, when possible, to verify that information regarding whether the seal is on land or at sea is correct. Patterns of diving and hauling out will be presented as histograms. Dive data histograms will present the number of dives at different depth increments and by duration of dive. Means and standard deviations for dive depth and duration will be calculated and compared for seals in different locations or habitats and at different times of day and year.

Dive data will be presented as graphs and histograms which indicate the range in individual behavior as well as summary data for all seals combined. Compilation of data on time and location of feeding dives will be used to identify feeding areas near different haulouts. If sensors indicating whether the seal is on land or at sea become more reliable and the necessary PTT software is developed to provide a continuous record of this information, then diving and hauling out cycles will be examined relative to time of day, tide, and season. Hauling out bouts and tidal cycles will be overlaid and plotted. Summaries of the number and quality of uplink data and at-sea position data will be presented in tabular form. Tabular summaries will also be prepared for use of different haulouts by individual seals; the number of haulout bouts relative to tidal state and time of day; and frequency of haulout and amount of time spent feeding by season.

These data will be used to evaluate site fidelity of seals, to quantify the amount of interchange among haulouts within and outside of the area impacted by the EVOS, to determine seasonal importance of particular haulouts, and to identify areas used for feeding.

c. Alternatives

One alternative is to not fund any further harbor seal studies under the restoration program, despite the ongoing decline and absence of recovery in the oiled area. Without a monitoring program will there will not be up-to-date information on harbor seal counts, and therefore trend, in PWS. Managers will have to rely on trend count data through 1993 which show a continuing decline. Without studies of habitat use, movements, and behavior, we will come no closer to understanding the reasons for the decline. No additional information will be acquired to guide us in management actions which could reduce the impact of human activities on these seals. The lack of up-to-date and better data may impact commercial fisheries in PWS. It is likely that management actions regarding the incidental take of harbor seals in fisheries will be very conservative, and perhaps unnecessarily restrictive. Without current data, subsistence hunters in PWS will not have the information they need to make informed decisions about harvest levels in the face of an ongoing decline.

An alternate methodology to satellite-tagging is the use of VHF telemetry. VHF transmitters are inexpensive to purchase. They are quite reliable for short distances when signals are not obstructed by geographic barriers and are useful for monitoring attendance at particular haulouts. However, the logistics required to monitor them are expensive and labor intensive; they must be tracked either from aircraft or by field personnel stationed near the tagging location. During much of the year, weather in PWS is foggy and stormy and flying is either precluded or dangerous. If the seals swim more than a few miles from the monitoring station, or around an island with significant geographic relief, the signals can no longer be acquired. Diving seals are extremely difficult to track, since it is very difficult to fix location based on the few transmissions that occur while they are at the surface to breathe. It may be difficult to relocate seals if they swim long distances in unpredictable directions as they did in 1992. At best, VHF technology gives an indication of some of the haulouts that are used by a seal and of its activity patterns while it is on that particular haulout.

Satellite telemetry is considered a far-preferable alternative to VHF telemetry in PWS. In contrast to VHF radios, PTTs transmit data to satellites regardless of whether investigators are in the field to They do not require the use of aircraft or field monitor them. stations. Data transmission is not limited by weather or time of day. Microprocessors allow data to be stored for a 24-hr period, greatly increasing the probability that a transmission will be sent when a satellite is overhead. Every time that a seal surfaces for a sufficiently long period of time, data are transmitted. Such data give a much more complete picture of movements and hauling out behavior than do intermittent VHF data. In addition, the PTTs provide data on duration and depth of dives that are not available from conventional VHF transmitters.

5. Location

This project will be conducted in PWS. Aerial surveys will be conducted of 25 trend count sites shown in Figure 1 and listed in Table 1. Tagging work will take place at a variety of locations throughout PWS.

The information obtained by this study will benefit residents of Tatitlek, Chenega Bay, and other PWS communities that use harbor seals for subsistence, and tourists or other recreational users by providing information on trends in abundance, biology of the seals, and insight into possible causes for the ongoing decline. Data will benefit PWS fishermen by ensuring that restrictive measures regarding incidental take of harbor seals are not implemented unnecessarily due to lack of data.

Information contributed by this study will help to identify areas of particular biological significance to harbor seals. Such information will serve as the basis for management recommendations to protect the



integrity of important seal habitats and to ensure that human activities do not have further impact on harbor seals. Tagging data will be valuable in further refining aerial survey methodology, particularly in determining the best time to conduct surveys.

6. Technical Support

No support from technical working groups is needed. Computer, GIS, and statistical support will be provided by project personnel. No hydrocarbon analyses are expected as part of this project.

7. Contracts

Costs of acquiring PTT data from Service ARGOS are paid for through a contract with NOAA. This contract covers all ADF&G Wildlife satellite tagging projects (sea lions, harbor and spotted seals, caribou), not just this harbor seal restoration project, and is processed by the Division of Wildlife Conservation. Funds for data acquisition must be encumbered and guaranteed to NOAA in early February. Actual contract processing occurs later in the spring.

Charter aircraft for surveys will not require contracts. Vessel support for tagging work will utilize small vessels contracts which will be completed by the PI. Satellite PTTs will be purchased under contract award from Wildlife Computers. The contract award was negotiated in 1992 and will be active throughout the duration of this project. An RSA will be written with University of Alaska Fairbanks for blood physiology work. This RSA will include the cost of personnel to assist in collecting, analyzing, and interpreting blood samples taken from seals that are caught during tagging operations.

Mitigation Measures

No mitigating measures are required for environmental compliance.

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D. Schedules and Planning

A schedule of field activities, data analysis, and report preparation is presented in Table 2 and a list of key personnel in Table 3. Field trips to attach PTTs will take place in April/May and September. Trend count surveys during pupping will be conducted during June. Molting surveys will be conducted during late August/September. Aerial survey data will be analyzed in winter following completion of molting surveys. Satellite data retrieval and analysis will be ongoing throughout the period when PTTs are transmitting data. An interim report will be submitted by April 1995 which will describe progress to date and present the preliminary results in the form of charts, histograms, graphs, and tables. A draft final report will be submitted in September 1996 and the final report by 31 December 1996. It is the intent of the investigators to prepare the results of this study for publication in the peer-reviewed literature after completion of the project.

Satellite data and survey data will be archived at ADF&G in digital format. Hard copy will be generated and filed at ADF&G and a copy sent to the National Marine Mammal Laboratory. Copies of digital satellite data will also be held at Texas A & M University. All data will be organized and filed according to standard scientific procedures. Original copies of field data will be retained at ADF&G and copies provided to others upon request. Copies of study plans, data analyses, summaries, and reports will also be filed at ADF&G.

The project will be coordinated and managed by ADF&G. The principal investigator is Kathryn Frost, Division of Wildlife Conservation. Lloyd Lowry, Marine Mammals Coordinator for ADF&G will assist with all aspects of the study. Cooperating institutions will included University of Alaska Fairbanks, Texas A & M University, the Alaska Sea Grant Marine Advisory Program, and the National Marine Mammal Laboratory (NMML).

Data analyses will be conducted by personnel from ADF&G, with cooperation and assistance from Texas A & M University. The Alaska Sea Grant Marine Advisory Program will contribute a person to assist with tagging. Blood physiology work will be conducted by scientists

from University of Alaska and Texas A & M University.

Software for programming the PTT microprocessors and for extracting information on geographic location and diving behavior from the diskettes provided by ARGOS will be obtained from the tag manufacturer. Additional data analysis software will be developed or acquired by ADF&G and Texas A & M.

Logistics for this project will be arranged by ADF&G. The aerial survey component will require charter of a single engine, fixed-wing aircraft (Cessna 180 or 185) on floats out of Cordova. The tagging component will require the use of multiple small vessels: one or two chartered sleep-aboard vessels (10-15 m) to transport and house project personnel; one 6 m Boston Whaler (ADF&G property) to be used in deploying seal nets; and two other 4-5 m skiffs (ADF&G property) to maneuver nets and check for and remove entangled seals.

E. EXISTING AGENCY PROGRAM

This project is funded entirely by the Trustee Council as a restoration project. ADF&G conducts no other studies of harbor seals in PWS that are not a part of the restoration program. The Subsistence Division of ADF&G is funded by the Trustee Council to monitor the harvest of harbor seals in PWS.

P. ENVIRONMENTAL COMPLIANCE/PERMIT/COORDINATION STATUS

NOAA has determined that the harbor seal study (Project No. 94064) qualifies for categorical exclusion (CE) and does not require an environmental assessment, per a memo from Byron Morris, NOAA, dated 18 December 1992.

As required by the Marine Mammal Protection Act, 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. They are available for review by state agencies and the public through a Notice of Receipt published in the Federal Register.

G. PERFORMANCE MONITORING

The PWS harbor seal project will be coordinated by the principal investigator, Kathryn Frost, who is a Marine Mammals Biologist with the ADF&G Division of Wildlife Conservation in Fairbanks. Other key personnel will be Lloyd Lowry, ADF&G Marine Mammals Coordinator, and Rob Delong, Analyst Programmer with the Division of Wildlife Conservation in Fairbanks. The PWS harbor seal study will be one of three components in a statewide harbor seal study which is being coordinated by Mr. Lowry. The other two components are being managed by Jon Lewis, Division of Wildlife Conservation in Anchorage. The involvement of these three key personnel as a team in all components the harbor seal studies will ensure that methodology for aerial

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surveys, satellite telemetry, data analysis, and other aspects of these projects will be consistent and coordinated. It will also ensure that at all times there are at least two other persons familiar with all aspects of the harbor seals projects, and thus able to take over in case of emergency or should an unforeseen change in personnel occur. All individuals were involved in 1991-1993 PWS harbor seal aerial surveys and satellite 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 beconducted to ensure the availability of field personnel and logistics. Supervisors or support personnel have been consulted to determine their availability to this project. The appropriate GIS and associated analytical software are available and are currently being used to analyze data from 1992 and 1993. 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 an 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. It is the intent of the investigators to prepare the findings of this study for publication in a peer-reviewed journal.

H. COORDINATION OF INTEGRATED RESEARCH EFFORT

The only other harbor study in PWS proposed for 1994 is project 94244, "Harbor seal and sea otter co-op subsistence harvest assistance." The principal invistigator for this study and for the subsistence study are in regular communication. Information about the results of survey and tagging studies are shared with personnel from 94244.

ADF&G is conducting other studies of harbor seals in southeast Alaska and near Kodiak with funding from NOAA/NMFS. Those studies contain similar components to the PWS harbor seal study (aerial surveys and satellite tagging) and are closely coordinated to ensure that data are collected and analyzed in a compatible manner. Equipment is shared by the two projects. Consequently, it has not been necessary for the PWS project to purchase many equipment items and supplies solely for the use of this study. Because of these other ongoing projects, the PWS harbor seal project has had access to a GIS system with which to analyze survey and tagging data.

Samples are provided by this project to a variety of institutions conducting research on harbor seals. The cost for sample analysis is being born by other projects and or institutions but the data are

available to this project. This includes genetics samples, blood and serum for a variety of physiological studies, bacterial and viral swabs for disease studies, and ultra-sound measurements. Our understanding of PWS harbor seals will benefit greatly by access to This project will supply blubber, blood, and whisker these data. samples to 1994 studies to analyze stable isotopes and lipids in order to better delineate food webs in PWS. Methodology for stable isotope and lipid analyes will be developed cooperatively with other bird and mammal studies conducting similar work. Information on distribution and movements of harbor seals, and diving behavior, will be shared with PWS modelling studies to look at energy flow within PWS, and with forage fish studies that are investigating the effects of predation on fish population dynamics.

Although this project is conducted by investigators from ADF&G, there are cooperators from the University of Alaska and Texas A & M University. Both universities are conducting physiological studies of harbor seals using samples provided by this study. NOAA/NMFS is cooperating in the analysis of genetics samples. The National Marine Mammal Laboratory/NMFS is cooperating in the review and coordination of this project with other ongoing harbor seal research.

I. PUBLIC PROCESS

The principal investigator has talked with numerous representatives of the public, including those from the tourism industry, fisheries, conservation groups, and subsistence communities. Through personnel from Subsistence Division, input has been requested from residents of Chenega Bay and Tatitlek about particular concerns regarding harbor seals, where they are particularly scarce, harvest trends, etc. Marine mammals staff from ADF&G, not only project personnel, regularly attend meeting with various public groups to inform them about the status of harbor seals, important harbor seal conservation issues, and key research needs. The principal investigator has presented the findings of this study at oil spill symposia, national conferences, and in the published literature.

J. PERSONNEL QUALIFICATIONS

Kathryn Frost has conducted research on marine mammals in Alaska since 1975. She has undertaken research on natural history and ecology of seals and beluga whales, including aerial and photographic surveys; radiotagging of belugas to study behavior and movements; and studies of food habits and trophic interactions of seals, belugas, walruses, and bowheads. She has conducted extensive aerial surveys of harbor seals in PWS and boat-based observations and sampling of harbor seals as part of NRDA studies following the EVOS. She is currently investigating the habitat use and haulout behavior of spotted seals in northwestern Alaska, which includes attaching satellite tags to spotted seals. She conducted satellite tagging studies of harbor seals in PWS in 1991-1993.





Lloyd Lowry is the Marine Mammals Coordinator for the State of Alaska. He has conducted research on marine mammals in Alaska since 1975, including studies of the natural history, ecology, distribution, abundance, and food habits of seals, walruses, and whales. He participated in the EVOS response, and NRDA studies on harbor seals. He participated in the development and application of radiotags for beluga whales. He has been responsible for project coordination and management of state and federally funded research projects, and is familiar with the federal marine mammal permit system. He is participating in a study to attach satellite tags to spotted seals in the Chukchi Sea. He has participated in all aspects of satellitetagging studies of harbor seals in PWS.

Ron Delong is an Analyst Programmer for ADF&G. He has developed custom software for the analysis of location and dive data from satellite-tagged seals. He was responsible for procuring, setting up and creating user-friendly interfaces for a PC-compatible GIS (PC Arc Info and Arc View) which is used in presenting seal location and movements information. Mr. Delong is accomplished in seal catching and tagging techniques.

Jay Ver Hoef is a Biometrician for ADF&G. He has been responsible for all aspects of statistical analysis of harbor seal aerial survey data during NRDA and restoration studies. He has participated in field work in PWS and is familiar with seal catching and tagging techniques.

Randy Davis has conducted research on the biology and physiology of marine mammals since 1976. He specializes in the diving behavior and physiological adaptations for diving in marine mammals. His research has included field and laboratory studies of swimming energetics, including the swimming metabolism of harbor seals; under-ice movements of antarctic seals; and the effects of oil on sea otters. He has used radio telemetry and time depth recorders in his studies and is currently involved in a project to attach satellite transmitters to spotted seals in the Chukchi Sea. He is currently assisting in the analysis of dive data acquired from PWS harbor seals in 1991-1992.

Table 1. Prince William Sound harbor seal trend count route.

Site #	Description	Status	relative	to EVOS

1	Sheep Bay		unoiled	
2	Gravina Island		unoiled	
3	Gravina Rocks		unoiled	
4	Olson Bay		unoiled	
5	Porcupine Point		unoiled	
6	Fairmont Island		unoiled	
7	Payday		unoiled	
8	Olsen Island		unoiled	
9	Point Pellew		unoiled	
10	Little Axel Lind Island		unoiled	
11	Storey Island		oiled	
12	Agnes Island		oiled	
13	Little Smith Island		oiled	
14	Big Smith Island		oiled	
15	Seal Island		oiled	
16	Applegate Rocks		oiled	
17	Green Island		oiled	
18	Channel Island		unoiled	
19	Little Green Island		unoiled	
20	Port Chalmers		unoiled	
21	Stockdale Harbor		unoiled	
22	Montague Point		unoiled	
23	Rocky Bay		unoiled	
24	Schooner Point		unoiled	
25	Canoe Passage		unoiled	

Table 2. Schedule of activities from February 1994 through December 1996 for restoration science study "Habitat Use, Behavior, and Monitoring of Harbor Seals in Prince William Sound." Letters are initials of personnel indicated in Table 3.

Activity	Dates	Personnel
Coordination meeting	Feb 1994	KF, LL, JL, RAD, JV
Reserve 1994 ARGOS	m-1. + n.m.4	<i></i>
Satellite channels	FeD 1994	KF, DR
Order PTTS	red 1994	
Attach Six Prrs	Apr-May 1994	KF, LL, RAD, JV, DR
Retrieve ARGUS data	Apr-Aug 1994	KF.
Conduct trend count	7	100
pupping surveys	Jun 1994	KF
conduct trend count		
molting surveys	Aug-Sep 1994	UM, KF
Attach Six PTTS	Sep 1994	KF, LL, RAD, JV, RD
Retrieve ARGOS data	Sep 1994-May 1995	KF
Analyze aerial survey		
data	Nov-Dec 1994	KF, JV, RAD
Analyze satellite data	Ongoing, 1994-95	KF, LL, RD, RAD, JV
Prepare interim report	Feb 1995-Mar 1995	KF, LL, RAD, JV
Submit interim report	15 Apr 1995	KF
Reserve 1995 ARGOS	~ ~ ~ ~ ~ ~	
satellite channels	Jan 1995	KF, DR
Order PITS	Jan 1995	KF
Attach six PTTs	Apr-May 1995	KF, LL, JV, RAD
Retrieve ARGOS data	Apr-Aug 1995	KF
Conduct trend count		
pupping surveys	Jun 1995	KF
Conduct trend count		
molting surveys	Aug-Sep 1995	DM, KF
Attach six PTTs	Sep 1995	KF, LL, RAD, JV, RD
Retrieve ARGOS data	Sep 1995-May 1996	KF
Analyze aerial survey		
	Nov-Dec 1995	KF, RAD, JV
Analyze satellite data	Ongoing, 1995-96	KF, LL, RD, RAD, JV
Final data analysis	waA-nnt 1940	KF, LL, RD
The average of the and the second		RAD, JV
Prepare final draft	Aug. Com. 1000	12 TS T T T T T
report Cubmit Anoth warant	Aug-Sep 1996	
Domina final manage	004-D00 1000	NF VP
Revise final report	OCC-DEC TAAP	ΛΓ
ounmit textsed linal	21 5000 1000	¥7.173
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EVOS	Harbor	Seal	Restorati	on	Study,	1994-1996
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Table	3.	Perso	onnel	invo	lved	in	restorat	tion	n sciend	ce stud	Y I	"Habitat	
		Use,	Behav	vior,	and	Mon	itoring	of	Harbor	Seals	in	Prince	
		Willi	iam Sc	und.	1								

Name	Affiliation	Responsibilities
Kathryn Frost	ADF&G	Project leader; tagging; aerial surveys; data analysis; reporting
Lloyd Lowry	ADF&G	Project review and coordination; permits; tagging, data analysis, and reporting
Robert A. DeLong	ADF&G	Programming; tagging
Jay VerHoef	ADF&G	Data analysis; tagging
Dennis McAllister	ADF&G	Conduct trend count surveys
Dan Reed	ADF&G	Satellite data acquisition; coordination with ARGOS
Randy Davis	Texas A&M	Assist with tagging; data analysis



Figure 1. Map of the Prince William Sound study area showing oiled and unoiled trend count sites.

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FROM: Willette, Mark

- TO: ALL HQ RESTORATION STAFF Montague, Jerome
- CC: Hughes, Dean

SUBJECT: Forage Fish DPD PRIORITY: 4 ATTACHMENTS: 94FORAG.FM3 94FORAG.WK3 FORAGE.DSP

Jerome,

Attached is my part of the Forage Fish DPD. Bruce Wright will stop by to pick it up. Thanks, Mark





Project Description: Harbor Seal Monitoring and Satellite-Tagging - This project will monitor the abundance of harbor seals at 25 trend count sites in PWS and will characterize habitat use, hauling out, and diving behavior so that important habitat can be properly managed. Counts will be compared to historical data and to data collected following the oil spill to determine whether seals in oiled areas have stopped declining.

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budget Category:	1995 FIDJECTIND.	SS Report	riemaning Court	Tatal					
	93040	94 interim	Cost	TOTAL	FRIAT				
	Authorized FFY 93	FFY 94	FFY 94	FFY 94	<u>FFY 95</u>	Comment			
		4047	400.0	400.0	455.0				
Personnei	\$104.7	\$04.7	\$33.2	>20.0	\$00.3				
Iravel	\$10.2	\$2.4	\$9.2	\$11.6	\$0.0				
Contractual	\$46.7	\$36.4	\$46.3	\$82.7	\$13.0				
Commodities	\$49.9	\$1.1	\$55.6	\$56.7	\$0.9				
Equipment	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0				
Capital Outlay	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0				
Subtotal	\$211.5	\$104.6	\$145.0	\$249.6	\$69.2				
General Administration	\$19.0	\$12.3	\$8.3	\$20.6	\$9.2				
Project Total	\$230.5	\$116.9	\$153.3	\$270.2	\$78.4				
Full-time Equivalents (FTE)	1.6	1.0	0.5	1.5	0.8				
	Dollar an	nounts are sh	own in thouse	ands of dollar	S.				
Budget Year Proposed Personne	! ;	Reprt/Intrm	Reprt/Intrm	Remaining	Remaining				
Position Description		Months	Cost	Months	Cost				
Reprt 1 Wildlife Biologist III		5.0	\$27.0	1.0	\$6.0				
1 Wildlife Biologist III		1.0	\$6.4	1.0	\$6,4	(Funding requests for FFY 96	and beyond		
1 Analyst Programmer III		1.0	\$4.8	0.5	\$2.4	will be determined after comp	letion of 1994		
1 Biometrician II		1.0	\$5.4	0.5	\$2.7	field season. Data will be eval	uated to		
1 Wildlife Technician IV		3.0	\$11.7	1.0	\$3.9	determine the need for addition	nal work. At		
1 Wildlife Biologist III		1.0	\$6.0	0.0	\$0.0	this time, additional work is n	ot anticipated).		
1 Program Manager		0.5	\$3.4	1.5	\$10.1	NEPA Cost:	\$0.0		
1 Wildlife Technician V		0.0	0.0	0.5	\$2.4	*Oct 1, 1993 - Jan 31, 1994			
	Personnel Total	12.5	\$64.7	6.0	\$33.9	**Feb 1, 1994 - Sep 30, 199	4		
07/14/93		*********	*****				[
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1994	aluul Seal r	habitat Use	and month	oung l	PROJECT				
Printed: 3/17/94 1:28 PM Agency: AK Dept. of Fish & Game						DETAIL			

Trav	JI:	Reprt/intrm	Remaining
Intrm Intrm	Travel to 10th Biennial Marine Mammal Conference to present study results (Galveston, Nov. 93 - 1 person) Per diem	\$1.5 \$0.9	\$0.0 \$0.0
	Costs include transportation of field party of 6-8 people from Anchorage/Fairbanks to Valdez/Cordova for 2 field efforts per year. Per diem will be a combination of commercial, state, and field facilities. This also includes travel and per diem for one observer for each of two aerial surveys to travel from Anchorage/ Fair- banks to Cordova and remain for 10-14 days.		
	3 RT Anchorage - Valdez at \$0.2 K (\$0.6 K) for tagging	\$0.0	\$0.6
	4 RT Fairbanks - Valdez at \$0.3 K (\$1.2 K) for tagging	\$0.0	\$1.2
	2 RT Fairbanks - Cordova at \$0.6K (\$1.2 K) for surveys	\$0.0	\$1.2
	2 RT Kodiak - Anchorage at \$0.4K (\$0.8 K) för tagging	\$0.0	\$0.8
	Per diem for travel (\$5.4K)	\$0.0	\$5.4
	Travel Total	\$2.4	\$9.2
Cont	ractual:		
Reprt	Service ARGOS (French satellite company) - FYY 93 obligation (satellite-transmission data)	\$12.0	\$0.0
	These funds are to cover data acquisition in calendar year 1994 for Platform Terminal Transmitter -		
	satellite tag (PTT). The minute the PTTs are attached, we are obligated to pay for the data.		
Reprt	Print/graphics	\$0.3	\$0.0
Reprt	Long distance phone charges/postage	\$0.7	\$0.0
Intrm	ARGOS - FYY 94 field work	\$23.0	\$0.0
	Funds must be encumbered for the PTTs to be deployed in May and September 1994 by January 1994. To do so, an active budget code is required in January.		
Intrm	Print/graphics	\$0.2	\$0.0
intrm	Phone/postage	\$0.2	\$0.0
	Contractual funds include data acquisition time for Service ARGOS at about \$400/month per PTT. Also included are costs of printing/graphics, phone/fax, air freight, equipment repair, and vessel charter at \$1200/day for 20 days per year. Cost of charter aircraft for survey is included at 30 hours per survey at \$220/hour. Database management cost of \$500/year is included for network access.	\$0.0	\$46.3
L	Contractual Total	\$36.4	\$46.3
07/14/5	Project Number: 94064	F	ORM 2B
1	994 Page 2 of 3 Project Title: Harbor Seal Habitat Use and Monitoring	P	ROJECT
	Printed: 3/17/94 1:28 PM Agency: AK Dept. of Fish & Game		DETAIL

Commodities: Reprt Supplies - office supplies, paper, computer diskettes, graphics materials, film	Rep	prt/Intrm \$0.9	Remaining \$0.0
Intrm Supplies - office supplies, paper, computer diskettes, graphics materials, film Supplies - includes 12 PTTs per year at \$4,000/PTT, vessel fuel, office and field supplies, repair, boat parts and supplies, computer software for data analysis and presentation, film for aerial surveys, and seal nets		\$0.2 \$0.0	\$0.0 \$54.9
Computer network supplies		\$0.0	\$0.7
Commoditi	es Total	\$1.1	\$55.6
Equipment:			
Equipme	ent Total	\$0.0	\$0.0
1994Page 3 of 3Project Number: 94064Project Title: Harbor Seal Habitat Use and Monitoring Agency: AK Dept. of Fish & Game		P	ORM 2B ROJECT DETAIL

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94066

NO DETAILED PROJECT DESCRIPTION REQUIRED --PROJECT IS A CONTINUATION OF PREVIOUSLY APPROVED WORK

BRIEF PROJECT DESCRIPTION FOLLOWS

EXXON VALDEZ OIL SPILL PROJECT DESCRIPTION

Title: Harlequin Duck Recovery Monitoring

Project Number: 94066

Lead Agency: ADF&G

Cooperating Agency: NOAA

Cost of Project, FY94: \$286.9K Cost of Project, FY95: \$231.6K

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

Geographic Area: Prince William Sound

INTRODUCTION

The Exxon Valdez oil spill significantly affected harlequin ducks. 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, fewer potential breeders during pre-nesting, very little nesting activity near streams, and only a few broods within oiled 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 overwinter, 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 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 contaminant studies around Kodiak Island in 1990. The reproductive impairment of harlequin ducks in the oil spill area may be a chronic effect of petroleum

Project Number: 94066

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 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 as follows: (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 continued harlequin duck 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.

ROJECT 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

siological 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 under deastern 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 assign to appropriate project participants. The Waterfowl Coordinator will be responsible for

Project Description

dministrative 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)

	ADF&G	NOAA	TOTAL
Personnel	153.6	26.0	179.6
Travel	10.5	0.0	10.5
Contractual	43.2	0.0	43.2
Commodities	19.1	4.5	23.6
Equipment	0.0	0.0	0.0
Capital Outlay	0.0	0.0	<u>0.0</u>
Subtotal	226.4	30.5	256.9
General			
Administration	<u>26.1</u>	<u>3.9</u>	30.0
Project Total	252.5	34.4	286.9
NEPA Compliance	0.0		

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EXXON VALDEZ TRUSTEE COUNCIL FY 94 DETAILED PROJECT DESCRIPTION

A. COVER PAGE

Project title: Herring Bay Monitoring Studies Project ID number: 94086 Project type: Monitoring Name of project leader(s): Raymond C. Highsmith, Michael Stekoll Lead agency: Alaska Department of Fish and Game Cooperating agencies: University of Alaska Cost of project/FY 94: \$531.4K Cost of project/FY 95: est. \$541K Cost of Project/FY 95: est. \$541K Cost of Project/FY 96 and beyond: est. \$541K per year 1996, 1997 Project Start-up/Completion Dates: 3/1/94-9/31/94 Geographic area of project: Herring Bay, Knight Island, Prince William Sound Name of lead agency project manager: Dr. Joseph R. Sullivan, Fisheries Program Manager, ADF&G

B. INTRODUCTION

Following the EXXON Valdez oil spill (EVOS) 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, in Prince William Sound. Both data sets show clear damage 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 seaweed in this community is 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 between and 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 damage and have shown the least recovery (Highsmith *et al.* 1993a). *Fucus* was severely damaged by the oil spill and subsequent clean-up efforts. In some areas, entire *Fucus* beds were decimated by the combined effects of oil and clean-up, 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 damaged 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 (Highsmith *et al.*, 1993a). The CHIA study found significantly higher densities of *Chthamalus dalli* on oiled sites than control sites for the 2nd and/or 3rd meter vertical drop in all three regions (Highsmith *et al.*, 1993b). 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 glandula* and *Semibalanus balanoides*, in the lower intertidal (Connell, 1961). *Chthamalus dalli* appears to be the barnacle species that initially benefited from the free space created by the oil spill and clean-up activities. We will continue to monitor recruitment and post-settlement survival studies within the barnacle zone to determine the fate of *C. dalli* relative to *B. glandula* and *S. balanoides*.



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 (Highsmith et al. 1992). These size differences are due to growth rate differences prior to the spill. 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. We are addressing this question 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 those sites that have been oiled. 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.

C. PROJECT DESCRIPTION

1. Resources and/or Associated Services:

The resource targeted for this study is the intertidal community within the EVOS impacted area, using Herring Bay as the experimental and monitoring site. To fully understand the dynamics of recovery, it is essential that we continue to monitor the intertidal zone. Monitoring until population densities stabilize at oiled sites will allow us to more fully assess the original damage 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. We predict that pre-spill densities of many organisms were greater at oiled sites than at the control sites.

2. Relation to Other Damage Assessment/Restoration Work:

The intertidal is used as foraging grounds by predators such as Black Oyster-Catchers, Harlequin Ducks, and Sea and River Otters, all of which have been studied for Damage Assessment/Restoration. During three field seasons (through summer 1991) following EVOS, research was conducted within the intertidal zone throughout the oil-affected region during the Coastal Habitat Injury Assessment project (CHIA). This data set showed clear damage to intertidal invertebrates and algae through the final sampling period. The experimental sites in Herring Bay allow us to follow the recovery of some of these key intertidal species that showed

damage during the CHIA study.

3. Objectives:

a. 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.

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

c. 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.

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

e. Deploy and monitor biodegradable fabric into the high intertidal to promote *Fucus* recolonization.

4. Methods:

a. Population dynamics of Fucus, sessile invertebrates, and grazers will continue to be quantified in established quadrats at six pairs of oiled and unoiled sheltered-rocky and coarse-textured sites. Organisms will be counted within six quadrats that have been permanently established within each of the first three meters of vertical drop below mean high high water. The quadrats will be visited twice during the summer and the number of Fucus plants counted and sizefrequency 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 quadrats 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 quadrat was scraped of all barnacles. An adjacent section was left unscraped. Both the scraped and unscraped guadrats will be monitored for recruitment of juveniles and abundance of adult barnacles.

b. 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 reported (Highsmith *et al.* 1992, Houghton *et al.* 1991). Quadrats were permanently marked along each of four transects on each site during the 1993 field season. All mussels in each quadrat were collected and are being analyzed for size frequency distributions. The quadrats will be monitored for



recruitment into the cleared area. In addition, new quadrats will be scraped within the mussel zone on transects placed 1m 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 high high water during each field visit. Subsamples will be collected to determine the number of young mussels that have settled onto the algae.

c. 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 into plastic molds. Replicate cylinders will be deployed in the intertidal at each site in conjunction with recruitment and growth studies. In addition, comparisons will be made for cylinders deployed at different tidal heights within sites. The data analyzed to date for cylinders deployed in 1993 show very low variance among replicates deployed within 20 cm of each other. 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.

d. 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, we will measure the growth of established *Fucus* plants of various sizes in all tidal levels at oiled and control sites in Herring Bay. 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.

e. 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 we will continue to monitor cleared plots with various sized buffer zones that were established in 1993. 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.

f. 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, we will continue to monitor the number of eggs settled

on oiled and control beaches over a 24 hour period. Grooved plexiglass plates (5X7cm) 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.

References:

Connel, J.H. 1961. The influence of interspecific competition and other factors on natural populations of the barnacle *Chthamalus stellatus*. Ecology 42:710-723.

Highsmith, R.C., A.J.Hooten, M.S. Stekoll, P. van Tamelen, L. Deysher, L. McDonald, D. STrickland, and W.P. Erickson. 1993a. Herring Bay Experimental and Monitoring Studies. Final status report to the *Exxon Valdez* Oil Spill Trustees, October 1993.

Highsmith, R.C., M.S. Stekoll, W.E. Barber, L. Deysher, L. McDonald, D. Strickland, and W.P. Erickson. 1993b. Comprehensive assessment of coastal habitat. Final status report to the *Exxon Valdez* Oil Spill Trustees, December 1993.

Highsmith, R.C. (and several co-authors). 1992. Comprehensive Assessment of the Coastal Habitat. Draft preliminary status report. Submitted to the *Exxon Valdez* Oil Spill Trustees, December 1992.

Houghton, J.P. (and several co-authors) 1991. Evaluation of the intertidal and shallow subtidal biota in Prince William Sound following the *Exxon Valdez* oil spill and subsequent shoreline treatment. Report No. HMRB91-1 National Oceanic and Atmospheric Administration.

5. Location:

The proposed monitoring studies will be conducted in the Herring Bay, 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 EVOS impacted area will be better understood.

6. 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. GIS services will be needed from ADNR to prepare publication quality maps of the sites.

7. 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.

D. SCHEDULES

During the summer of 1994 there will be four trips to Herring Bay. A tentative schedule of working days in Herring Bay is:

Trip #1: 20-31 May Trip #2: 20-28 June Trip #3: 4-13 August Trip #4: 2-10 September

A schedule of major landmarks is as follows:

Detail the study plans	Jan-Feb 1994
Finalize boat charter contract	Mar-Apr 1994
Field Sampling Period	May-Sep 1994
Sample Analyses	Jun-Oct 1994

Data analysis / interpretation

Jun-Oct 1994 Nov-Dec 1994

Report preparation / writing

Submit draft report to ADF&G

Dec 1994

Submit final report 45 days after draft is returned

The major project personnel will dedicate their time to this research as follows:

1. Dr. Ray Highsmith (Coordinator, Principal Investigator)

Responsible for overall coordination of project personnel, experimental design, interpretation of data, writing of reports and subsequent proposals, budget oversight.

2. Dr. Michael Stekoll (Co-Principal Investigator)

Responsible for algal experimental design, interpretation and synthesis of data, and writing of reports.

3. Dr. Larry Deysher (Restoration Investigator)

Responsibilities will include experimental design and monitoring for high intertidal Fucus study, interpretation and synthesis of algal data, writing of reports.

4. Dr. Mark Johnson (Co-Principal Investigator)

Responsible for physical oceanographic survey utilizing ADCP, data analysis and interpretation, writing of reports.

5. Dr. Peter van Tamelen (Research Associate)

Responsible for algal experimental design, supervising algal field studies, interpretation and synthesis of data, and writing of reports.

6. Susan Saupe (Chief Scientist)

Responsible for invertebrate experimental design, acting as overall chief scientist onboard vessel, interpretation and synthesis of data, writing of reports and proposals.

7. David Doudna (Project Manager)

Responsible for administering the budget, obtaining charters and sub-contracts, and overall logistics for the project.

8. Technicians (TBA)

Conduct field experiments and monitoring in addition to sample and data analyses for preparation of reports.

E. EXISTING AGENCY PROGRAM

None known.

F. ENVIRONMENTAL COMPLIANCE/PERMIT/COORDINATION STATUS

We anticipate that this project will be categorically excluded from all NEPA regulations. State scientific collection permits will be obtained prior to the start of the field season from the Alaska Department of Fish and Game.

G. PERFORMANCE MONITORING

The Coordinating Principal Investigator, Dr. Ray Highsmith, 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, Dr. Michael Stekoll, along with Dr. Peter van Tamelen and Susan Saupe, will be responsible for drafting standard operating procedures, 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 check on their accuracy. Data base 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, 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.

H. COORDINATION OF INTEGRATED RESEARCH EFFORT

We will be coordinating efforts with Drs. Mike Stekoll and Larry Deysher for field

sampling of Restoration of High Intertidal *Fucus* study. Both investigators will be onboard the vessel during two of the four sampling periods to deploy and monitor the biodegradable fabric used to promote *Fucus* recolonization.

I. PUBLIC PROCESS

Several talks on the intertidal research conducted during the damage assessment/restoration studies were presented at the Exxon Valdez Oil Spill Symposium held in Anchorage, February 1994, to which the public was invited. Papers were presented at the Western Society of Naturalists meeting in Newport, Oregon in January 1993 and to the Presidents of Pacific Rim Universities at the 4th International Symposium of the Conference of Asian and Pan-Pacific University Presidents, Sept 12-15, 1993, in Anchorage. In addition, all reports submitted to the lead agency are available to the public through the Oil Spill Public Information Center.

J. PERSONNEL QUALIFICATIONS

1. Dr. Raymond Highsmith

Dr. Highsmith has been the Coordinator and Principal Investigator of two Exxon Valdez Oil Spill projects; the Coastal Habitat Injury Assessment project and the Herring Bay Experimental and Monitoring studies. His background includes ongoing research of recruitment and population biology in the intertidal zone. He is familiar with the effects of the oil spill on intertidal invertebrates throughout the EVOS impacted area. Dr. Highsmith has published numerous papers on the ecology of intertidal and benthic communities in Alaska. He is currently a Professor at the School of Fisheries and Ocean Sciences at the University of Alaska, Fairbanks, and is Director of the West Coast National Undersea Research Center.

2. Dr. Michael Stekoll

Dr. Stekoll has been a principal investigator of two Exxon Valdex Oil Spill projects; the Coastal Habitat Injury Assessment project and the Herring Bay Experimental and Monitoring Studies. He has been present in Herring Bay during the 1989-1993 field seasons and is familiar with all study sites. He is intimately familiar with the effects of the oil spill on intertidal algae throughout the EVOS impacted area. He has also performed many projects on the biology and ecology of *Fucus* and other seaweeds in Alaska and has published these results. Dr. Stekoll is currently a Professor at the University of Alaska Southeast with a joint appointment in the School of Fisheries and Ocean Sciences at the University of Alaska Fairbanks.

3. Dr. Lawrence Deysher

Dr. Deysher has been an investigator for two EVOS project: the CHIA study and the Herring Bay studies. He was involved in both Phase I (site-selection) and Phase II (damage assessment) of the CHIA project. Larry is a senior scientist at Coastal Resource Associates in Vista, California. His specialties are general intertidal ecology, algal ecology and taxonomy and ecological surveys. He has been present in Herring Bay during the 1990-1993 field season and is familiar with the established study sites. He has conducted a pilot study on the use of biodegradable fabrics for use in restoration of *Fucus*.

4. Dr. Peter van Tamelen

Dr. van Tamelen has been working in Herring Bay on intertidal algal studies since 1990. He has extensive experience in marine intertidal ecolocy including studies on plant-herbivore interactions, succession, algal recruitment, and effects of physical factors on biological communities. He has spent over 14 months in Herring Bay and is very familiar with the established study sites and the natural history of Herring Bay. He has several manuscripts specific to Herring Bay ecology in preparation or in press. Dr. van Tamelen is currently a Research Associate at the University of Alaska Southeast.

5. Dr. Mark Johnson

Dr. Johnson has successfully deployed his ADCP unit from the contracted vessel in September 1993 and collected water current data from within Herring Bay and Knight Island Passage. He has many years of experience studying the physical oceanography of the arctic and sub-arctic. During the past several years, Dr. Johnson has completed intensive ADCP data collections and analyses. He has published extensively and is currently an Associate Professor at the University of Alaska, Fairbanks.

6. Susan Saupe

Susan Saupe has worked on intertidal invertebrate damage assessment studies since 1990 for both the CHIA and Herring Bay studies. She has supervised the design of experiments during field studies and oversaw the data analysis and integration for the CHIA reports and manuscripts. She has acted as Chief Scientist onboard vessels during the damage assessment/restoration studies for over 10 months, including several field trips during the Herring Bay restoration and monitoring studies. She is also responsible for writing proposals, reports, and manuscripts.

7. David Doudna

Dave Doudna has been project manager for the Coastal Habitat Injury Assessment project since and the Herring Bay Experimental Monitoring studies since 1990. He oversaw all management aspects of the project including logistics and personnel placement. As manager, he obtained charters for and staffed with field personnel three charter vessels for a 3 month field seasons during the summer of 1991 and for the Herring Bay studies in 1992 and 1993. He administered subcontracts for vessels, air charters, freight and shipping of equipment, and consulting firms and oversaw all budgets and the distribution of all proposals and reports.

8. Technicians/Graduate Students

The technicians and graduate students all have experience in the intertidal during either the CHIA or Herring Bay studies and have been trained in the

taxonomic identification of invertebrates and algae. They are familiar with all of the sampling techniques used in the field and the data entry and analysis procedures used for report preparation. The alternate Chief Scientist, Tama Rucker, has acted as Chief Scientist during the CHIA study and has been involved with that study since it's inception in 1989. Tama has helped design or is familiar with every sampling method used in the field on these projects to date and has been responsible as laboratory supervisor for the sorting and analyses of all samples collected during the CHIA study. She is also responsible for writing reports and manuscripts.

The following is a list of some of the oil spill related contracts on which all or some of the above-mentioned principal investigators collaborated:

Trustees (Oil Spill) via Alaska Dept. of Fish and Game. Herring Bay Restoration/Monitoring Studies. 3/15/93-6/30/94, \$442,000 (R. Highsmith, M. Stekoll, P. van Tamelen, A. Hooten, L. Deysher), Contact person Dean Hughes (907) 267-2207.

Trustees (Oil Spill) via U.S. Forest Service. Comprehensive Assessment of Injury to Coastal Habitats:Phase II. 3/1/92-6/30/93, \$2.3 million (R. Highsmith, M. Stekoll, W. Barber, L. McDonald, D. Strickland, L. Deysher), Contact person Dave Gibbons (907) 586-8784.

Trustees (oil Spill), via Alaska Dept. of Fish and Game. Herring Bay Restoration/Monitoring Studies. 3/1/92-2/28/93, \$451,000 (R. Highsmith, M. Stekoll, P. van Tamelen, A. Hooten, L. Deysher), Contact person Dean Hughes (907) 267-2207.

Trustees (Oil Spill) via U.S. Forest Service. Comprehensive Assessment of Injury to Coastal Habitats:Phase II. 3/1/91-2/28/92, \$5.1 million (R. Highsmith, M. Stekoll, W. Barber, L. McDonald, D. Strickland, L. Deysher), Contact person Dave Gibbons (907) 586-8784.

Trustees (oil Spill), via Alaska Dept. of Fish and Game. Herring Bay Restoration/Monitoring Studies. 3/1/91-2/28/92, \$245,000 (R. Highsmith, M. Stekoll, L. McDonald, D. Strickland, A. Hooten), Contact person Dave Gibbons (907) 586-8784.

Trustees (Oil Spill), via U.S. Forest Service. Comprehensive Assessment of Injury to Coastal Habitats: Phase II. 10/1/90-2/28/91, \$1.3 million (R. Highsmith, M. Stekoll, W. Barber, L. McDonald, D. Strickland), Contact person David Gibbons (907) 586-8784.

K. Budget

Personnel	\$2	278.5
Travel	\$	19.0
Contractual	\$	104,1
Commodities	\$	10.9
Equipment	\$	5.0
Total Direct	\$4	417.4
Indirect @ 20%	\$	83.6
Project Total	\$E	501.0

Project Description: Herring Bay Experimental & Monitoring Studies - This is a long term intertidal study in Herring Bay to investigate the factors that limit and/or facilitate recolonization of intertidal invertebrates and algae. This study provides long term intertidal data.

					1		
Budget Category:	1993 Project No.	'93 Report/	Remaining				
	93039	'94 Interim*	Cost**	Total	· ·		
	Authorized FFY 93	FEY 94	FFY 94	FFY 94	FFY 95	Comment	
Personnel	\$7.5	\$3.4	\$6.7	\$10.1	\$10.1		
Travel	· \$0.0	\$0.0	\$0.0	\$0.0	\$0.0		
Contractual	\$441.7	\$181.4	\$501.0	\$682.4	\$682.4		
Commodities	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0		
Equipment	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0		
Capital Outlay	\$0.0	\$0.0	\$0.0	\$0.0	\$0,0		
Subtotal	\$449.2	\$184.8	\$507.7	\$692.5	\$692.5		
General Administration	\$21.3	\$13.2	\$23.7	\$36.9	\$36.9		
Project Total	\$470.5	\$198.0	\$531.4	\$729.4	\$729.4		
Full-time Equivalents (FTE)	0.2	0.1	0.1	0.2	0.2		
	Dollar a	mounts are sh	nown in thous	ands of dollar	s,		
Budget Year Proposed Personnel	;	Reprt/Intrm	Reprt/Intrm	Remaining	Remaining		
Position Description		Months	Cost	Months	Cost		
Reprt Program Manager		0.5	\$3.4	1.0	\$6.7		
						NEPA Cost: \$0.0	
						*Oct 1, 1993 - Jan 31, 1994	
	Personnel Total	0.5	\$3.4	1.0	\$6.7	**Feb 1, 1994 - Sep 30, 1994	
07/14/93		\$	******				
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Page 1 of 3 Project Number: 34086							
1994	. Proje	ct Title: H	erring Bay	perimenta	I & Monitor	ring Studies	
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DETAILED RESTORATION PROJECT DESCRIPTION

Project Title:	Mussel Bed	Mussel Bed Restoration and Monitoring								
Project ID#:	94090	94090								
Project Type:	General Res	General Restoration, Research/Monitoring								
Project Leader(s):	Stanley D. R Malin M. Bal Patricia M. F Christine Bro Ronald Bruy Gail V. Irvine	Stanley D. Rice, National Marine Fisheries Service Malin M. Babcock, National Marine Fisheries Service Patricia M. Rounds, National Marine Fisheries Service Christine Brodersen, National Marine Fisheries Service Ronald Bruyere, Alaska Department of Environmental Conservation Gail V. Irvine, National Park Service								
Lead Agencies:	NOAA/Natio Alaska Depa	nal Marine Fis Irtment of Env	sheries Service ironmental Cons	servation						
Cooperating	J Agencies:	DOI/Nationa	Park Service	· · · · · ·						
Project Cost:	FY94: \$668.	4K FY95	: \$395.9K							
Start Date:	October 1993 Finish Date: 31 December 1997									
Geographic Area d	of Project:	Oil spill impa and Alaska l	icted areas of Pr Peninsulas	ince William Sound, and Kenai						
Project Leader:	Stanley Rice	•								

Project Manager: Bruce Wright



A. Introduction

The persistence of *Exxon Valdez* crude oil underlying some dense mussel (*Mytilus trossulus*) beds in Prince William Sound (PWS) began to cause concern in Spring, 1991, among scientists from federal and state agencies. This presence of relatively unweathered crude oil may be providing a source of chronic contamination of the overlying mussels thus being a pathway for continued exposure to petroleum hydrocarbons through ingestion by higher consumers. There may be linkage to 2 species of birds - harlequin ducks and black oystercatchers; and possibly other higher consumers. The presence of these contaminated beds is also of concern for human subsistence and particularly the residents of PWS.

Based on preliminary survey and sampling results from 1991, this study was formally funded in 1992. We documented 50 mussel beds in PWS and 9 mussel beds along the Kenai and Alaska Peninsulas (data collected by the National Park Service) with underlying sediment concentrations in excess of 1700 μ g/g total petroleum hydrocarbons (TPH) (Babcock et al, 1993a & b). The highest oil concentrations found in animals or sediments in 1991 and 1992 were in mussels and underlying substrates from oiled mussel beds in PWS (Babcock, 1991; Babcock et al, 1993a & b; Rounds et al, 1993). Data from samples taken from identical sites in 1991 and 1992 show little change in hydrocarbon (HC) levels - indicating little effect from natural cleansing processes 3 and 4 growing seasons following the oil spill. In 1993, we observed little or no reduction in *Exxon Valdez* crude oil for many of the mussel beds that were resampled.

Minimally intrusive site manipulation (removing a 30 cm wide strip of mussels through the blue to facilitate flushing of oil below) and intensive sampling of mussels and sediments were conducted at 3 heavily oiled mussel beds in PWS in 1992 as well (Babcock et al., 1993b). Monitoring of hydrocarbon levels associated with the strips of mussels removed from contaminated beds has demonstrated some enhanced recovery, but it appears to be limited to areas directly adjacent to the cleared strips. Natural cleansing of the beds, even with minimal intrusive "channeling" techniques has not occurred in the five years since the spill, and contaminated mussel beds continue to be a risk to highe consumers. Consequently, in 1994 ADEC and NOAA will use a more extensive and aggresive method to attempt to clear most of the remaining oil beneath several of the most highly contaminated Prince William Sound mussel beds. The mussels will be removed from the beds, the oiled sediment below them removed and replaced with uncontaminated sediment, and the mussels replaced.

An additional goal of our study is to determine the biological impacts of chronic exposure to *Exxon Valdez* crude oil on mussels; this sampling is integrated with sampling for the primary function of collecting samples for chemical analyses. Sampling for this goal will be minimal as most of the test mussels were collected in previous years and continue to be analysed and data evaluated. Mussels fill too important of an ecological niche and are too important as a food source for the impacts of chronic exposure to crude oil (for 5+ growing seasons) on their biology to remain unknown.



В.

Project Description

1. Resources and/or Services

The resource is the mussel beds themselves, as food source and habitat, which may be a pathway of oil contamination to higher consumers. These higher consumers, and human subsistence and recreational activities will benefit from the removal of this crude oil.

2. Relation to Other Damage Assessment/Restoration Work

Information produced on petroleum hydrocarbon levels will be shared and used by other studies, 1994 and previous years, oriented toward higher consumers; i.e. harlequin ducks (1994 #94066), oystercatchers (1994 #94020), and river otters (not funded 1994).

The Kenai and Alaska Peninsula component of this study (1994, completion only, and previous years) was done by the National Park Service.

3. Objectives

- a. 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).
- 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).
- c. To measure the physiological and reproductive injury in mussels chronically exposed to petroleum hydrocarbons (NOAA).
- d. To determine recovery in levels of petroleum hydrocarbons in mussels and underlying sediments in oiled mussel beds along the Kenai and Alaska Peninsulas. This portion consists of analysis of data from previous sampling; no 1994 field work is included under this objective (NPS).

4. Methods

 <u>Mussel Bed Cleaning</u>: Physical removel of oiled sediments is proposed for the cleaning portion of this study. Between 20 and 30 oiled mussel beds sites will be targeted for cleaning using existing 1991-1993 hydrocarbon data; and, preliminary surveys during April and May, 1994.
to stake mussel beds and locate adjacent suitable replacement sediments. Additional selection criteria for this process will include der 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 cleaning process will consist of (1) temporary removal of the mussel layer, (2) removal and dispersal of the underlying oiled sediments, (3) replacement of removed material with clean sediments obtained from adjacent, clean areas, and (4) the return of the mussels. Feasibility tests in 1993 indicate that mussels will reattach themselves to suitable substrate during the subsequent tidal cycle. HC levels in both sediments and mussels will be monitored.

All less intrusive alternative cleaning methods conducted in 1992 and 1993 tried so far have been found to be of minimum value. More disrubtive methods, such as removing entire beds and waiting for natural re-establishment, seem unwise due to the dependence of many species on the beds (oiled or not) for food and habitat.

b. <u>Hydrocarbon Sampling</u>: Sampling of mussels, underlying sediments, an replacement sediments will be done prior to actual physical disturbance the beds during the cleaning process. Mussel and sediment sampling will follow the methods used in previous years and consists primarily of triplicate pooled samples of mussels and underlying sediments. Follow up sampling (2-month) on the earliest beds cleaned will be conducted as the opportunity arises during the last field trip. Annual evaluation is scheduled to occur in 1995.

Natural recovery and/or persistence of oiling will be monitored at some of the other oiled mussel beds identified during the field seasons, 1991-1993. We expect to accomplish this sampling during vessel and aircraft field trips for the primary purpose of the restoration activities.

Sediment samples will be analyzed by ultraviolet fluorescence as adapted from Krahn et al, 1991. This procedure was instituted at ABL in 1992 successfully. Selected sediments and mussels then will be analyzed by gas chromatography/mass spectroscopy (GC/MS) for quantitative measurements of HC analytes (Larsen et al., 1992).

Freezing, chain-of-custody procedures and record keeping will follow Natural Resource Damage Assessment protocol.

Data will be analyzed using standard statistical methods. It will be displayed on maps using ABL's Geographical Mapping System, and entered into the *Exxon Valdez* Natural Resource Damage Assessment Hydrocarbon Data Base.

c. <u>Effects on Mussels</u>: Biological impacts on mussels will be investigated by measuring various indices, and conducting histopathological evaluation. Samples collected over the growing seasons in 1992 and 1993 from several olled and control sites are being processed for histopathological examination by NOAA staff in Seattle.

5. Location

Prince William Sound area impacted by Exxon Valdez oil.

6. Technical Support

With the exception of contracts below, NOAA's Auke Bay Laboratory and AK Department of Environmental Conservation will provide all technical support. Hydrocarbon analyses, histopathological evaluation, GIS mapping will be conducted in house by NOAA.

7. Contracts

Contracts will be needed for field support (vessel, helicopter, fixed-wing aircraft, and cleaning crew to provide manual labor for actualy removal and replacement of oiled sediments). All services will be acquired by the Alaska Department of Environmental Conservation through standard State of Alaska procurement protocols.

8. Literature Cited

- Babcock, Malin. Hydrocarbon analyses of mussels and substrates/sediments collected from Prince William Sound, 1991: A special survey of oiled mussel beds. A report to the Exxon Valdez Oil Spill Trustee Council. 4 Nov., 1991.
- Babcock, Malin, Gail Irvine, Stanley Rice, Patricia Rounds, Joel Cusick, and Christine Brodersen. 1993a. Oiled mussel beds two and three years after the Exxon Valdez oil spill. Pp. 184-185, in Exxon Valdez Oil Spill Symposium. Sponsored by Exxon Valdez Oil Spill Trust. Counc., U AK Sea Grant Coll. Prog., Amer. Fish. Soc., AK Chap. Anchorage. Alaska.

Babcock, Malin M., Stanley D. Rice, Patricia M. Rounds and Christine C. Brodersen. 1993b. Recovery monitoring and restoration of intertidal oiled mussel beds in Prince William Sound and impacted by Exxon Valdez of spill. Status Report to the Exxon Valdez Trustee Council. National Oceanic and Atmospheric Administration; National Marine Fisheries Service; Auke Bay Laboratory, 11305 Glacier Highway, Juneau, AK 99801. 55 pp.

- Krahn M. M., G. M. Ylitalo, J. Joss, and S-L. Chan. 1991. Rapid, semiquantitative screening of sediments for aromatic compounds using sonic extraction and HPLC/fluorescence analysis. Mar. Environ. Res. 31:175-196.
- Larsen, Marie, Larry Holland, Dan Fremgen, Josefina Lunasin, Mona Wells, and Jeffrey Short. 1992. Standard operating procedures for the analysis of petroleum hydrocarbons in seawater, marine sediments, and marine faunal tissue at the Auke Bay Laboratory. Internal document. Auke Bay Laboratory, Alaska Science Center, NMFS, NOAA, 11305 Glacier Highway, Juneau, Alaska 99801-8626.
- Rounds, Patricia, Stanley Rice, Malin M. Babcock, Christine C. Brodersen.
 1993. Variability of Exxon Valdez hydrocarbon concentrations in mussel bed sediments. Pp. 182-183, in Exxon Valdez Oil Spill Symposium.
 Sponsored by Exxon Valdez Oil Spill Trust. Counc., U AK Sea Grant Coll.
 Prog., Amer. Fish. Soc., AK Chap. Anchorage, Alaska.

Schedule D. 10,1.93 - 3,1.94 Chemical analyses of samples taken 1993; planning; ordering supplies; 1993 data analyses; histopathological processing and evaluation. 3.1.94 - 5.31.94 Further data analyses nd histopathological evaluation; interim report preparation and production - 4.15.94: logistics planning. Throughout year Chemical analyses, data analyses and interpretation, report preparation. Field Schedule 4.24.94 - 4.30.94 First 1994 aircraft field trip during low tide series to choose, evaluate and stake out candidate mussel beds to be cleaned. 5.23.94 - 5.29.94 Second 1994 aircraft field trip during low tide series to choose, evaluate and stake out candidate mussel beds to cleaned.

6.20.94 - 6.28.94	First vessel charter to clean and restore mussel beds and conducted associated sampling of mussels and sediments
7.7.94 - 7.13.94	Second vessel charter to clean and restore mussel beds.
7.20.94 - 7.26.94	Third vessel charter to clean and restore mussel beds.
8.5.94 - 8.11.94	Alternate low-tide series if any preceding vessel trip unfeasible.

Personnel and Responsibilities:

NOAA:

Principal Investigator Stanley Rice - Malin Babcock PI/Project Leader - Patricia Rounds Logistics planning; data collection and analyses - Christine Brodersen Data analyses; data collection, program support - Frank Morado Histopathology - 2 TBA PWS field crew Jeffrey Short Chem lab management/Quality assurance & control L Marie Larsen Chemical analysis L chemists Chemical analyses ADEC: - Ronald Bruvere PI/Project Leader Logistics planning, Field duty - TBA - TBA Logistics planning, Field duty

NPS:

F.

Gail Irvine

Project Leader: GOA survey, data analysis GOA survey, data analysis

E. Existing Agency Program

The Program Manager for Habitat Investigations, NOAA's Auke Bay Laboratory, will spend approximately one month's salary coordinating and managing this project: cost estimated at \$10K. Histopathological evaluation will entail travel and supplies covered by project funds but salary will be donated by NOAA - estimated 3 months: cost estimated at \$21K.

Environmental Compliance/Permit/Coordination Status

An Environmental Assessment, required for the actual cleaning of oiled mussel beds, will be issued in compliance with the National Environmental Policy Act (NEPA). NOAA

is the Federal agency with lead on compliance. One Assessment will be written combining intertidal activities for both this project and work to be conducted under Shoreline Assessment and Oil Removal (Study #94266).

Field sampling of oiled mussel beds not cleaned is essentially a non-intrusive research project in which routine data collection, limited in context and intensity, will be done; consequently, this portion is categorically exempt from requirement to provide an Environmental Impact Statement or Environmental Assessment.

G. Performance Monitoring

1. Management Plan

Overall Manager Report Coordination	NOAA GS-14	ADEC TBA	<u>NPS</u>
Field Logistics, Study design, Report Preparation	GS-12	TBA	GS-12
	GS-11	TBA	GS-7
	GS-9	TBA	
Chemical Quality Control.	GS-13		
Chemical Analyses	GS-11		
· · · · · · · · · · · · · · · · · · ·	GS-11		
Chemical Analyses, Field Sampling	GS-9		
2. The following reports/manuscripts are anticipated:			
1. Interim report, 1993 sampling		June 1994	

2. Manuscript draft: High concentrations of hydrocarbons in mussels and underlying substrates two and three years after the *Exxon Valdez* oil spill

3. Manuscript draft: Relationship of HC in mussels from contaminated substrate types three years after the *Exxon Valdez* oil spill May 1994

4. Briefing of Trustee Council on 1994 mussel bed cleaning October 1994

5. Interim Report, 1994 sampling and restoration April 1995

6. Manuscript Draft: Contamination recovery of mussels from oiled mussel beds where contaminated mussels and underlying substrates were removed in strips to increase natural flushing of the beds April 1994

7. Report: Biological impacts of oiled substrates on mussels three and four years after the *Exxon Valdez* oil spill A

August 1994

May 1994

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8. Tech Memo: Oil contamination in mussels from oiled mussel beds in PWS and the Kenai Peninsula, a geographic look with relative intensities October 1994

9. Final Report: 6 months after HC analyses are completed.

Quality assurance checks are an integral part of ABL's hydrocarbon processing and analyses. ABL participates in a world-wide interlaboratory calibration exercise on an biannual basis and has routinely performed in the top analytical laboratories.

Biological data generation and collection are routinely conducted without reference to the origin of the mussels; i.e., data gathered blindly.

H. Coordination of Integrated Research Effort

The logistics for restoration of oiled mussel beds will be shared and closely coordinated with field needs and activity under Shoreline Assessment and Oil Removal (Study #94266). The actual removal and replacement of sediments will occur under the auspices of ADEC with NOAA doing the site selection, and before and after sampling for petroleum hydrocarbon monitoring. Data from this project continue to be shared with sibtidal sediment studies and injured species studies (harlequin duck, etc.)

I. Public Process

The Public Process for this project has been integrated with the Trustee Council process for the 1994 Work Plan.

J. Personnel Qualifications

STANLEY D. RICE

Education: Chico State Univ. B.A. 1966, M.A. 1968, Biological Sc. Kent State Univ. Ph.D. 1971, Comparative Physiology

Experience: 1971-present. Researcher, Auke Bay Laboratory, National Marine Fisheries Service, Juneau, Alaska. Over 65 publications, most with oil toxicity and oil impacts to fish and invertebrates. Field, lab, and analytical expertise with hydrocarbons and effects. Studies have included field toxicity tests in Port Valdez, acute and long term toxicity tests, physiological impacts - including growth and reproduction. In 1986, became program manager for Habitat Investigations at ABL. Duties include management of all habitat related research at ABL, from parasite studies, logging impacts, oil toxicity exposures, to chem lab analyses. Program averaged about 24 man years of effort up to 1989. Management of budgets, staff, proposals, and research were part of my duties, plus continuation as a researcher on specific projects.

After the *Exxon Valdez* oil spill, I became responsible for management and coordination of all Damage Assessment studies from ABL, including multispecies trawling assessments and salmon impact studies by other ABL program units. I managed about 50 man years of effort in 1989 (Habitat programs plus *Exxon Valdez* Damage Assessment activities), and about 35-45 in 1990 and 1991. I was responsible for opening a NMFS office in Cordova for the summer of 1989, and spent the majority of summer 1989 in Cordova and PWS. I was a primary source input to the management team during the first 6 months of the spill. In addition to management activities, I have continued to participate as a researcher in some studies, including sediment-HC surveys and oiled mussel beds in 1992.

Honors: Outstanding Performance ratings in 1989 and 1990, NOAA Unit Citations for work on the IXTOC oil spill in 1979, and EXXON VALDEZ oil spill of 1989. Federal Employee of the Year nominee in Juneau in 1981 and 1989. Best Paper awards in 1982 and 1984 from ABL, and best paper nominee for NMFS in 1990.

Relevant Publications: Over 50 on oil exposures, including several major reviews on oil effects to fish and invertebrates. This includes the first major review of oil literature relevant to Alaska, in 1974, which was prepared as source material for the environmental impact statement for the marine aspects of the Trans-Alaska Pipeline.

MALIN M. BABCOCK

Education: Oregon State University, 1963. B. S., Zoology University of Alaska Fairbanks, 1968. M. S., Zoology (Fisheries)

Experience: 1969-present. Researcher and Task Leader, Auke Bay Laboratory, National Marine Fisheries Service, Juneau, Alaska. Field, lab, and analytical expertise, and data analyses and interpretation particularly with effects of petroleum hydrocarbons on aquatic fish and shellfish. Studies have included Prince William Sound chemical baseline, short term and long term water-soluble fraction of crude oil and sediment toxicity tests assessing physiological and biochemical impacts - including growth and reproduction. I became Task Leader for the Coastal Habitat task within Habitat Investigations, ABL, in 1988 and directly supervise several staff scientists in varied research projects. I have strong participation in overall Habitat Investigations research planning, budget management and staffing.

After the *Exxon Valdez* oil spill, I was co-principal investigator for the EVOS Coastal Habitat Study "Pre-spill and post-spill hydrocarbon concentrations in mussels and sediments in Prince William Sound", becoming Principal Investigator of this project in 1991 and 1992; was also Principal Investigator for the NRDA study "Injury to Oysters" in 1989. In 1991, I participated in the interagency planning for investigating an evolving problem - that of the effects of contaminated mussel beds on higher consumer organisms, and led the preliminary field effort for identifying these beds and sampling parameters to establish the extent and intensity of petroleum hydrocarbons contamination. This effort has provided a basis for this ongoing study. Along with other members of ABL's Habitat Investigations team, 1989, I assisted AK Dept. of Fish & Game staff in study design and methods for their species oriented areas of concern and continue to be a resource scientist in this area.

I have been Project Leader for NOAA for the PWS portion of Mussel Bed Restoration and Monitoring - coordinating and leading a staff to investigate extent and intesity of oiling; distribution of HCs within a mussel bed; effects of minimally intrusive manipulative techniques to reduce HCs by increasing exposure of oiled sediments; effects of chronic oiling on mussels (byssal thread production, condition and reproductive indices, glycogen stores, feeding rates, growth, and histopathological abnormalities).

Additionally, staff under my direct supervision are involved in many aspects of EVOS NRDA and Restoration program for several NRDA studies, training all NRDA study personnel in sampling for hydrocarbons, the NRDA/Restoration database, sample custody and tracking, etc.

Honors: Outstanding Performance ratings in 1988 and 1989; NOAA Unit Citation for work in the *Exxon Valdez* oil spill 1989; Federal Employee of the Year, Juneau, Alaska in 1985.

Relevant Publications: Over 25 publication/reports - most of which involve effects of exposure to petroleum hydrocarbons on various Alaskan species of fish and shellfish. Over 20 public presentations of scientific studies.

PATRICIA M. ROUNDS

Education: University of Alaska Fairbanks; B.S. Biological Science 1966 Graduate work at U of A Fairbanks, U of A Southeast, University of British Columbia

Experience: 1986 - present. Researcher, Auke Bay Laboratory, National Marine Fisheries Service, Juneau, Alaska. As co-principal investigator of NRDA study Subtidal 3, I and was responsible for field logistics and sample collection and assisted in data analysis and report preparation. I also assisted other NRDA projects in field collections. In 1992 and 1993, I participated in study design, field work, and proposal preparation for this project, formerly restoration Project R103 and 93036). Other areas of research have been habitat requirements of juvenile red king crab and sockeye salmon stock separation using parasites.

Honors: Outstanding Performance ratings 1988 (Special Act Award), 1989, 1991 and 1993. NOAA Unit Citation for work in the *Exxon Valdez* oil spill, 1989.

Relevant publications: Co-author of final reports for NRDA study Subtidal 3. Several public presentations of oil-related scientific research/

CHRISTINE C. BRODERSEN

Education: University of Washington, B.S. Zoology 1971. Graduate work, U of A Southeast

Experience: 1974 - present. Researcher, Auke Bay Laboratory, National Marine Fisheries Service, Juneau, Alaska. Twelve years of oil toxicity research on sensitivity of Alaskan marine life to Alaskan crude oils, particularly larval and juvenile crustaceans. Since the *Exxon Valdez* oil spill I have worked in the damage assessment and restoration processes. I have trained personnel from state and federal agencies involved in the NRDA process in procedures for taking and transporting scientifically valid hydrocarbon-analysis samples and maintaining legal defensibility of those samples. I have worked on tests of the health of mussels from oiled Prince William Sound mussel beds, measuring byssal thread production rates and in the measurement of feeding rates and the analysis of growth and condition factors. And I have assisted with data analysis and reporting for hydrocarbon sampling projects.

Honors: NOAA Unit Citation for work in the Exxon Valdez oil spill 1989.

Relevant Publications: 13 publication and reports - 9 on effects of exposure to petroleum hydrocarbons on various Alaskan species of fish and shellfish. Over 8 public presentations of scientific studies.

GAIL V. IRVINE

Education: University of California at Santa Barbara, 1969. B. A. (honors), Zoology University of Washington, Seattle, 1973. M. S., Zoology University of California at Santa Barbara, 1983. Ph.D., Biological Sciences (Aquatic and Population Biology)

Experience: 1984 - 1990. Marine Biologist, Minerals Management Service. Environmental analysis, including potential effects of oil and gas development on marine plants, invertebrates, and fishes (pelagic, nearshore and benthic communities). Research on coelenterate ecology in the Chukchi Sea.

1990 - present. Coastal Resources Specialist, National Park Service. Research in marine community ecology; developing and directing a coastal monitoring and research program for the National Park Service. Thus far, the research has been concentrated in two national parks oiled by the *Exxon Valdez* spill, Kenai Fjords and Katmai National Parks.

My education and experience have been concentrated in the fields of community and population biology, with most research in marine systems. I have spent extensive amounts of time doing research at marine labs in Puget Sound (the Friday Harbor Marine Labs) and Panama (through the Smithsonian Tropical Research Institute). Since coming to Alaska, I have gained additional experience in the Gulf of Alaska (Kenai Fjords and Katmai National Parks), Cook Inlet (Lake Clark National Park), and the Beaufort and Chukchi Seas.



K. Budget

Attached

1994 Federal Fiscal Year Project Budget October 1, 1993 - September 30, 1994

Project Description: Mussel Bed Restoration & Monitoring - ADEC and NOAA will rehabilitate mussel beds that are trapping hydrocarbons underneath them and probably contaminating higher levels of the food chain. Previous feasibility studies indicate that the beds can be temporarily moved, the area cleaned, and the beds replaced with very little harm to the mussels. Sites to be rehabilitated will be based primarily on previous survey work. Sampling will be done before and after to determine the success of the rehabilitation activities.

Budget Category:	1993 Project No.	'93 Report/	Remaining			
	93036	'94 Interim*	Cost**	Total		
`	Authorized FFY 93	FFY 94	FFY 94	FFY 94	FFY 95	Comment
Personnel	\$296.2	\$122.5	\$159.2	\$281.7	\$206.9	
Travel	\$42.5	\$2.0	\$30.4	\$32.4	\$27.4	
Contractual	\$127.5	\$0.2	\$222.7	\$222.9	\$62.0	
Commodities	\$82.8	\$15.0	\$66.2	\$81.2	\$64.2	
Equipment	\$66.0	\$0.0	\$0.0	\$0.0	\$0.0	
Capital Outlay	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	
Subtotal	\$615.0	\$139.7	\$478.5	\$618.2	\$360.5	
General Administration	\$53.4	\$18.4	\$39.5	\$57.9	\$35.4	
Project Total	\$668.4	\$158.1	\$518.0	\$676.1	\$395.9	
Full-time Equivalents (FTE)	5.6	2.0	2.5	4.5	3.0	
	Dollar an	nounts are sh	own in thous	ands of dollar	ι S.	
Budget Year Proposed Personnel	:	Reprt/Intrm	Reprt/Intrm	Remaining	Remaining	
Position Description		Months	Cost	Months	Cost	
See Individual 3A Form	is for			· · · · · · · · · · · · · · · · · · ·		
Personnel Details						
						NEPA Cost: \$5.0
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	Personnel Total	0.0	<u>\$0.0</u>	0.0	<u>\$0.0</u>	**Eah 1 1994 - San 20 1994
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1001 Page 1 o	f 10 Proje	ct Title: M	ussel Bed	toration	& Monitorir	PERSCT
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1994 Federal Fiscal Year Project Budget

October 1, 1993 - September 30, 1994

Project Description: Mussel Bed Restoration and Monitoring - NOAA will monitor mussel beds before and after hydrocarbons trapped underneath the mussel beds are removed. This will help determine both the effects on the mussel beds and the adequacy of the removal effort.

{						
Budget Category:	1993 Project No.	'93 Report/	Remaining			
· · · ·	93036	'94 Interim*	Cost**	Total		
udget Category: Personnel Travel Contractual Commodities Equipment Capital Outlay Subtotal General Administration Project Total Full-time Equivalents (FTE udget Year Proposed Personne Position Description april Program Manager GS-12 Project Leader GS-12 Chemist GS-11 Tish Biologist GS-11 Zoologist GS-11 Zoologist GS-11 Page 2 Printed: 4/7/94	Authorized FFY 93	FFY 94	FFY 94	FFY 94	FFY 95	Comment
Personnel	\$264.7	\$105.7	\$75.4	\$181.1	\$160.0	
Travel	\$36.5	\$2.0	\$26.3	\$28.3	\$20.0	
Contractual	\$82.5	\$0.0	\$12.0	\$12.0	\$30.0	
Commodities	\$75.2	\$15.0	\$59.2	\$74.2	\$60.0	
Equipment	\$62.0	\$0.0	\$0.0	\$0.0	\$0.0	
Capital Outlay	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	
Subtotal	\$520.9	\$122.7	\$172.9	\$295.6	\$270.0	
General Administration	\$45.5	\$15.9	\$12.2	\$28.0	\$26.1	
Project Total	\$566.4	\$138.6	\$185.1	\$323.6	\$296.1	
				-		
Full-time Equivalents (FTE)	5.0	1.7	1.2	2.9	2.1	
	Dollar ar	nounts are sh	own in thous	ands of dollar	5.	
Budget Year Proposed Personnel	l;	Reprt/Intrm	Reprt/Intrm	Remaining	Remaining	
Position Description		Months	Cost	Months	Cost	
Reprt Program Manager GS-12		0.9	\$4.4	0.6	\$3.1	
Project Leader GS-12		1.8	\$12.4	1.2	\$8.9	
Chemist GS-11		7.0	\$37.1	5.0	\$26.4	
Fish Biologist GS-11		3.5	\$20.2	2.5	\$14.4	
Zoologist GS-11		7.0	\$31.6	5.0	\$22.6	
						NEPA Cost: \$0.0
						*Oct 1, 1993 - Jan 31, 1994
	Personnel Total	20.2	\$105.7	14.3	\$75.4	**Feb 1, 1994 - Sep 30, 1994
07/14/9}	[m		04000		£	
[]	Proje	ict Number:	94090			FORM 3A
Dana O a	Proje	ct Title: M	ussel Bed F	lestoration	& Monitorir	ng SUB-
1994 ^{rage 2 o}	Sub-	Project: M	ussel Bed M	lonitorina		
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1994 Federal Fiscal Year Project Budget

October 1, 1993 - September 30, 1994

Trav	el:	Reprt/Intrm	Remaining
Reprt	Juneau to Anchorage (4 trips - air fare \$450 + \$550 per diem)	\$2.0	\$2.0
	Travel to scientific meeting/symposium (2 trips - air fare \$875 + 5 days per diem @ \$225/day) Field travel to Prince William Sound (6 staff/15 trips total) (15 trips - air fare \$450/trip + 4 days per diem @ \$225/day)	\$0.0 \$0.0	\$4.0 \$20.3
	Travel Total	\$2.0	\$26.3
	Histopathology contract for chronically exposed mussels to determine incidence of tissue abnormalities (cost based on prior contracts)	\$0.0	\$12.0
07/14/9		1 r	1 912.0
1	994 Page 3 of 10 Printed: 4/7/94 5:06 PM Project Number: 94090 Project Title: Mussel Bed Restoration & Monitoring Agency: National Oceanic Atmospheric Admin.	F P	ORM 3B

1994 Federal Fiscal Year Project Budget

October 1, 1993 - September 30, 1994

Com	moditie	95:							*********			Reprt/Intrm	Remaining
Reprt	Chemi	ical la	boratory	y supplies	(glassware	, gloves, stop	pers, tub	ing, scalpel	s and blades	, detergent, eye	guards,	\$6.0	\$9.0
	fir	rst aid	supplie	is, protecti	ve clothing	, instrument r	epair par	ts, filter pa	per, etc.)				¥
	Solver	nts/ch	emicals	4								\$5.0	\$13.0
	Office	and i	mapping	a supplies								\$3.0	\$9.0
	Public	ation	costs, f	ilm 	unting teres	n shavala na		er an strand me sta	to flant and	. ED assass of h	udro o orbio o	\$1.0	\$7.2
	meldig fre nd	gear, i ee gla oteboo	ssware, sks, labi	chemicals elling and s	strapping tote	ioil, boots, da ape, etc.)	n gear, s y packs,	coolers, ba	tteries, netti	ng, rebar, tape, ·	weather-proof	\$0.0	\$12,V
	Comp	uter s	oftware	and upgra	ides (memi	ory, Excel, Wi	ndows, C	DS/2 license	e, AutoCad}			\$0.0	\$6.0
											Commodities Total	\$15.0	\$59.2
Equit	oment:												
ļ													
								*					
L								****			Equipment Total	\$0.0	\$0.0
07/14/9	3					Project Nur	mber: 9	94090	********				1014 20
		1				Project Titl	e' Mue	sel Red F	lestoration	& Monitoring			
10	aa1		Page 4 of		10 Sub-Project: Mussel Red Monitoring				~	1		SUB-	
13	534					Aganau A	L. IVIUS		N Atrana	haria Automia		PI	ROJECT
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EXXON VALDEZ TRUSTEE COUNCIL 1994 Federal Fiscal Year Project Budget October 1, 1993 - September 30, 1994

Project Description: Mussel Bed Restoration & Monitoring - ADEC and NOAA will rehabilitate mussel beds that are trapping hydrocarbons underneath them and probably contaminating higher levels of the food chain. Previous feasibility studies indicate that the beds can be temporarily moved, the area cleaned, and the beds replaced with very little harm to the mussels. Sites to be rehabilitated will be based primarily on previous survey work. Sampling will be done before and after to determine the success of the rehabilitation activities.

		1			~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	
Budget Category:	1993 Project No.	'93 Report/	Remaining			
	93036	'94 Interim*	Cost**	Total		
	Authorized FFY 93	FFY 94	FFY 94	FFY 94	FFY 95	Comment
Personnel	\$0.0	\$0,0	\$83.8	\$83.8	\$15.8	Three 11 day trips are planned. The trips will
Travel	\$0.0	\$0.0	\$4.1	\$4.1	\$3,4	be timed to catch two low tides each day.
Contractual	\$0.0	\$0.0	\$210.7	\$210.7	\$4.0	DEC will field two work crews. A NOAA
Commodities	\$0.0	\$0.0	\$7.0	\$7.0	\$0.2	representative will accompany the crews.
Equipment	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	It is anticipated that approximately 25 beach
Capital Outlay	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	sites will be visited.
Subtotal	\$0.0	\$0.0	\$305.6	\$305.6	\$23.4	
General Administration	\$0.0	\$0.0	\$27.3	\$27.3	\$2.7	
Project Total	\$0.0	\$0.0	\$332.9	\$332.9	\$26.1	
Full-time Equivalents (FTE)	0.0	0.0	1.3	1.3	0.2	FFY 95 costs are close out costs.
	Dollar ar	nounts are sh	own in thousa	ands of dollar	5.	
Budget Year Proposed Personnel	4	Reprt/Intrm	Reprt/Intrm	Remaining	Remaining	· · · · · · · · · · · · · · · · · · ·
Position Description		Months	Cost	Months	Cost	
Project Manager		0.0	\$0.0	7.0	\$46.2	
Restoration Specialist		0.0	\$0.0	7.0	\$30.1	
Overtime (25% of RS time)	}	0.0	\$0.0	1.8	\$7.5	
						NEPA Cost: \$5.0
						*Oct 1, 1993 - Jan 31, 1994
	Personnel Total	0.0	\$0.0	15.8	\$83.8	**Feb 1, 1994 - Sep 30, 1994
07/14/93	Proto	at Nhumbar	04000	****		
[]	rioje	or maniper:	34030			FORM 3A
Door E	f 10 Proje	ct Title: M	ussel Bed F	lestoration	& Monitorii	ng 🖉
1994 - rage 5 0	Sub-	Project: Mi	ussel Bed	ration	Press CT	
Diverse Altrica	Ager	ncy: AK De	pt. of Envir	onmental C	Conservatio	DETAIL

EXXON VALDEZ TRUSTEE COUNCIL 1994 Federal Fiscal Year Project Budget October 1, 1993 - September 30, 1994

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Travel:			Reprt/Intrm	Remaining
Annhorai	vel: Anchorage to Juneau (\$450 air fare + \$150/day per diem x 4 days 2 trips) Anchorage to spiil area communities (\$350 air fare + \$150/day per diem x 2 days 3 trips) Travel Total Total </th <th>\$0.0</th> <th>\$2.1</th>	\$0.0	\$2.1	
Anchorac	te to spill area communities (\$	350 air fare + \$150/day per diem x 2 days - 3 trips}	\$0.0	\$2.0
,				,
		Travel Total	\$0.0	\$4.1
Contractual:				
Vessel ch	narter3 eleven dav cruises @	\$2,300/day (rate based on 1993 costs)	\$0.0	\$75.0
Aircraft a	and helicopter charterfrom cc	mmunities to vessel, Anchorage to vessel (45 hours @ \$600/hour)	\$0.0	\$27.0
Contract	Labor-contract with commun	ities6 laborers + supervisor	\$0.0	\$93.0
Film proc	essing		\$0.0	\$0.5
Storage u	unit rental		\$0.0	\$1.8
Telecom	munications, fax, mail, courier		\$0.0	\$2.0
Xerox and	id printing		\$0.0	\$1.5
Freight ar	nd cartage (move equipment,	ship supplies to field crews)	\$0.0	\$0.5
Hazardou	is materials training		\$0.0	\$3.0
Cleaning	of field gear		\$0.0	\$0.4
Hisk man	agement (mandatory insuranc	Se)	\$0.0	. \$6.0
				ĺ
** **	****	Contractual Total	\$0.0	\$210.7
)7/14/93		Project Number: 94090	1 [77]	0014 00
		Project Title: Mussel Red Restoration & Monitoring		JRIVI JB
100/	Page 6 of 10	Sub Project: Mussel Red Destantion		SOR-
1994	· · · · · ·	Jour-rivject, mussel bed nestoration	PI	ROJECT
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1994 Federal Fiscal Year Project Budget October 1, 1993 - September 30, 1994

Commodities:		Reprt/Intrm	Remaining
Small tools and safety gear (shovels, picks, pry bars, Film and video tape Office supplies (pens, paper, tape, toner packs, forms Field gear (gloves, rain suits, marking tape, boots)	buckets, flares, first aid kits) , etc.)	\$0.0 \$0.0 \$0.0 \$0.0	\$3.0 \$0.5 \$1.5 \$2.0
	Commodities Total	\$0.0	\$7.0
	Equipment Total	\$0.0	\$0.0
Project Num Project Num Project Titl Sub-Projec Agency: A	mber: 94090 e: Mussel Bed Restoration & Monitoring t: Mussel Bed Formation AK Dept. of Environmental Conservation	F	ORM 3B

1994 Federal Fiscal Year Project Budget October 1, 1993 - September 30, 1994

Project Description: Mussel Bed Restoration and Monitoring - This project will conduct recovery monitoring of oiled mussel beds and shorelines impacted by the *Exxon Valdez* oil spill in the northwestern Gulf of Alaska. This project will continue chemical monitoring of oiled mussels and associated sediments.

1									
Budget Categ	gory:	1993 Project No.	'93 Report/	Remaining					
		93036	'94 Interim*	Cost**	Total				
		Authorized FFY 93	FFY 94	FFY 94	FFY 94	FFY 95	Comment		
Personn	nef	\$31.5	\$16.8	\$0.0	\$16.8	\$31.1	The amount authorized for the NPS portion		
Travel		\$6.0	\$0.0	\$0.0	\$0.0	\$4.0	of this project in FFY 93 (\$102.0) included		
Contrac	stual	\$45.0	\$0.2	\$0.0	\$0.2	\$28.0	funds for analysis and report writing. Of that		
Commo	dities	\$7.6	\$0.0	\$0.0	\$0.0	\$4.0	amount, \$19.6 will not be spent in FFY 93		
Equipment		\$4.0	\$0.0	\$0.0	\$0.0	\$0.0	since not all hydrocarbon analyses have		
Capital Outlay \$0.		\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	been completed. Therefore, NPS will not be		
	Subtotal	\$94.1	\$17.0	\$0.0	\$17.0	\$67.1	spending that \$19.6 in FFY 93. NPS is		
General	Administration	\$7.9	\$2.5	\$0.0	\$2.5	\$6.6	requesting authorization to spend the \$19.6		
	Project Total	\$102.0	\$19.5	\$0.0	\$19.5	\$73.7	in FFY 94. NPS will use the \$19.6 from FFY		
							93 as a credit against a future court draw.		
Full-tim	e Equivalents (FTE)	0.6	0.3	0.0	0.3	0.7			
	Dollar			own in thous	ands of dollar	FFY 95 budget includes continuing field			
Budget Year	Proposed Personnel	>	Reprt/Intrm	Reprt/Intrm	Remaining	Remaining	work on oiled mussels, plus report		
Position	n Description	****	Months	Cost	Months	Cost	preparation for the FFY 94 field work.		
Reprt Marine	Ecologist GS-12		2.0	\$12.4	0.0	\$0.0			
Biologic	cal Technician GS-7		2.0	\$4.4	0.0	\$0.0			
							NEPA Cost: \$0.0		
			:				*Oct 1, 1993 - Jan 31, 1994		
L		Personnel Total	4.0	\$16.8	0.0	\$0.0	**Feb 1, 1994 - Sep 30, 1994		
67/14/93		Proie	ct Number	94090					
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EXXON VALDEZ TRUSTEE COUNCIL 1994 Federal Fiscal Year Project Budget October 1, 1993 - September 30, 1994

Travel:			Reprt/Intrm	Remaining
		Travel Total	\$0.0	\$0.0
Contractual:			\$0.2	40.0
			¥0,2	70.0
		Contractual Total	\$0.2	\$0.0
07/14/93	Project Number: 94090		FC	DRM 3B
1004 Page 9 of 10	Project Title: Mussel Bed Restoration & Monitoring			
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1994 Federal Fiscal Year Project Budget October 1, 1993 - Sentember 30, 1994

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Commodities:				Reprt/Intrm	Remaining
					n Artis
			:		
			;		
			Commodities Total	\$0.0	\$0.0
Equipment:					
			Equipment Total	\$0.0	\$0.0
.07/14/93		Project Number: 94090		F	ORM 3B
	Page 10 of 10	Project Title: Mussel Bed Restoration & Monitoring			SUB-
1994		Sub-Project: Mussel Bed Monitoring		PI	ROJECT
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94092

NO DETAILED PROJECT DESCRIPTION REQUIRED – PROJECT IS A CONTINUATION OF PREVIOUSLY APPROVED WORK

BRIEF PROJECT DESCRIPTION FOLLOWS

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.
- 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 Weather permitting, field personnel will spend an average of 8 to 10 study period. 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.
- 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.
- 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.

Project Description

Technical Support

None.

F. Contracts

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

SCHEDULES

1 Apr 1994

1 Jun 1994

Contract negotiation

1 Jun 1934

15 Jul 1994 to 15 Sep 1994

30 Dec 1994

15 Feb 1995

Select contractor

Field research

Draft report

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)

Personnel		48.9
Travel		5.6
Contractual	Маларанан сайтар Стариянан сайтар	89.0
Commodities		6.0
Equipment		0.0
Capital Outlay		0.0
Subtotal		149.5
General Administration		<u>13.6</u>
Project Total		163.1
NEPA Compliance		0.0

NOAA

•••

94102

EXXON VALDEZ TRUSTEE COUNCIL FY 94 DETAILED PROJECT DESCRIPTION

Project title: Marbled Murrelet Prey and Foraging Habitat in Prince William Sound, Alaska, in Summer Project ID number: 94102 Project type: Research Name of project leader(s): Katherine J. Kuletz Lead agency: USFWS/DOI Cooperating agencies: NOAA, ADF&G, and SEA Study Cooperators Cost of project/FY 94: \$231.5 Cost of project/FY 95: \$370 plus cost of FY94 write up: \$62.3 Cost of Project/FY 96 and beyond: \$325 per year Project Start-up/Completion Dates: 2/94 - 2/95

Project leader: 16th . 16th

Geographic area of project: Prince William Sound

Date: 18 march 1994

Katherine J. Kuletz, Wildlife Biologist DOI-FWS (Migratory Bird Management)

Project manager:

Date: 3/18/94

David Irons, Wildlife Biologist **DOI-FWS (Migratory Bird Management)**

B. INTRODUCTION

Marbled Murrelets (*Brachyramphus marmoratus*) are the most abundant seabird in Prince William Sound (PWS) in the summer, numbering about 100,000 birds, with approximately 25,000 birds remaining as winter residents. The PWS murrelet population has declined significantly since the early 1970's, when the population was estimated to number 300,000 in the summer (Klosiewski and Laing MS). Murrelets suffered high mortality in the *Exxon Valdez* oil spill (EVOS [Piatt et al. 1990, Kuletz MS]), but it is unlikely that the spill caused the entire 67% reduction in numbers observed in post-spill years.

Marbled murrelets nest primarily in trees, and in the southern portion of its range, murrelet populations have declined due to the extensive logging of old-growth forests where murrelets nest (Stein and Miller 1992). Within PWS, a comparatively small proportion of potential nesting habitat has been harvested to date. Gillnet fisheries may impact local murrelet populations (Carter and Sealy 1984), and murrelets are taken as by-catch in PWS (Wynne et al. 1991, 1992). At current levels the annual bycatch is estimated at 1-2% of the PWS population, which is unlikely to have caused the large population decline. Another factor that affects population levels is food availability, which if reduced, could cause reproductive failure or adult mortality.

Simultaneous to murrelet population declines, populations of other apex predators that eat small schooling fish in PWS, such as tufted puffins (Fratercula cirrhata), pigeon quillemots (Cepphus columba), arctic terns (Sterna paradisaea), black-legged kittiwakes (Rissa tridactyla) and harbor seals (phoca vitulina), have also declined (Oakely and Kuletz in review, Klosiewski and Laing MS, Kathy Frost, ADFG, pers. comm.). The concurrent decline in populations of a range of species using similar prev suggests an ecosystem wide change in prey type or abundance. Thus a primary focus of several studies in the FY94 EVOS Restoration Work Plan is to determine if food is limiting fish, marine bird and marine mammal populations in PWS. Project 94163 (the forage fish study) will correlate forage fish abundance and distribution with seabird abundance and distribution, and Project 94320 (the Sound Ecosystem Assessment Study [SEA]) will investigate predators, including birds, that may be impacting pink salmon (Oncorhynchus gorbuscha) and Pacific herring (Clupea harengus pallasi) populations. As the most abundant apex predator in PWS, the marbled murrelet is a an important part of the marine ecosystem. Information on the foraging ecology of the marbled murrelet can contribute to the development of PWS ecosystem trophic models.

In Alaska, murrelets are known to feed on a variety of forage fish, primarily Pacific sand lance (*Ammodytes hexapterus*), capelin (*Mallotus villosus*), pollock (*Gadidae spp*) and Pacific herring (Oakley and Kuletz 1979, Krasnow and Sanger 1986, Sanger 1987). In other regions they have been known to prey on salmonids (Carter and Sealy 1986). The spatial and temporal relationships between foraging and nesting habitats for murrelets are unknown. Murrelets forage primarily nearshore (<2 km) in shallow water (<30m) (Carter 1984, Thoresen 1989). The density of murrelets is



usually lower in fjords and deep pelagic waters (Sealy and Carter 1984, Kuletz et al. MSb). Additionally, murrelet distribution appears to change during the breeding season (Sealy 1975, Carter 1984, Kaiser et al. 1991, Kuletz MSb). Murrelets may be widely dispersed during the incubation phase (May - early June), and concentrate nearshore during the chick rearing phase (late June - July). The apparent change in murrelet distribution may reflect changes in prey distribution, but could also reflect energetic limitations imposed by the requirements of chick feeding.

Foraging and reproductive parameters of seabirds have shown correlations with prey types or prey availability (review in Furness and Nettleship 1991). Population declines in seabirds, and low reproductive success, have been associated with the crash of important forage fish stocks where those fish have been commercially exploited (Monaghan et al. 1989). Long foraging trips of seabirds have been correlated with low chick-feeding rates and subsequent breeding failures (Irons 1992, Hamer et al. in press). A black-legged kittiwake study in PWS demonstrated that birds nesting in a fjord flew about 8 times farther to forage than birds nesting in central PWS (Irons 1992). This difference is presumably due to lower food availability in the fjord than in central PWS.

This study, Project 94102, is a multi-year study with the overall objective to determine if food availability is limiting the recovery of the PWS murrelet population. In the long-term this hypothesis will be investigated by comparing inter-annual differences in murrelet foraging and reproductive parameters to relative prey abundance in PWS. In the first year the question of food limitation will be addressed by comparing differences in foraging and reproductive parameters to relative prey abundance in two areas in PWS. This comparison will indicate if food is more limiting in some areas of PWS than others. If food is limiting in an area, we will work toward determining the level of prey abundance that is detrimental to murrelets.

In 1994 we will describe the foraging ecology of murrelets in an area with potentially abundant prey and in an area with potentially scarce prey. We will identify prey species, locate foraging areas and use radio-tagged murrelets to determine the relationship between foraging areas and nesting areas. Murrelet nests are cryptic and solitary, and it is not feasible to monitor their reproductive success. We will therefore monitor their foraging behavior as an index of the energetic costs associated with reproduction. We will also initiate a pilot effort to develop an index of reproductive success. Finally, we will characterize oceanographic characteristics of murrelet foraging habitat and integrate information on prey distribution and abundance obtained by other studies.

C. PROJECT DESCRIPTION

1. Resources and/or Associated Services:

This study focuses on the marbled murrelet, one of the seabird species injured in the

Exxon Valdez Oil Spill and a threatened species under the Endangered Species Act in California, Oregon and California. By obtaining information on the murrelet's diet and foraging behavior in conjunction with prey-based studies (Project 94320, the SEA Study, and Project 94163, the forage fish study), it will provide complimentary information on forage fish availability and trophic pathways. The predator-prey relationships investigated in this study can be used to develop an ecosystem model for the Prince William Sound marine environment. If we locate murrelet nest sites we will also collect additional information on murrelet nesting habitat which will contribute to the database begun by Projects R15 and 93051B (Identification of Marbled Murrelet Nesting Habitat).

2. Relation to Other Damage Assessment/Restoration Work:

This study will be closely linked to data collection and analysis of the juvenile herring and forage fish components of Project 94163 and Project 94320. The diet component of this study will provide data to Projects 94320 and 94163 on murrelet predation of fish species. Project 94163 will collect data on fish and bird abundance at two study areas used by the murrelet project. These fish data will provide independent information on prey abundance that we will compare to the foraging behavior and reproductive success of murrelets. Project 94320 will provide more data on fish and bird abundance early in the season for at least the Naked Island study site. Field logistics, vessels and data collection will be coordinated with Project 94173 (the pigeon guillemot recovery monitoring study).

3. Objectives:

- Identify prey types used by murrelets during the breeding season in Prince William Sound.
- 2. Compare foraging behavior and productivity of murrelets nesting in a deep water fjord vs. a shallow water area in Prince William Sound.
- Characterize foraging habitat used by radio-tagged murrelets during the breeding season.

4. Methods:

Study Area. -- The primary study areas are the Naked Island group, in central PWS, and Blackstone Bay, a fjord in western PWS (Fig. 1). These areas were selected based on known murrelet nesting and foraging locations and to spatially integrate the study with the pigeon guillemot study, the forage fish study and the SEA study.

The shallow water study site will be the Naked Island group and will include waters within 5 km of Naked, Storey and Peak islands. Murrelets are known to nest in the forests of these islands (Kuletz et al. MSa), and there are historic estimates of approximately 3,000 murrelets within 5 km of the islands (Kuletz et al. MSb). There are also records of prey use and juvenile murrelet counts for these waters (Oakley and Kuletz 1979, Kuletz MS). The deep water fjord study site is Blackstone Bay. In surveys conducted in 1992, this area had murrelet dawn activity, indicating nesting birds (Marks et al. in review).

Objective 1: Diet

We will determine prey species used by adult murrelets by three methods: (i) analysis of stomach contents, (ii) blood lipid analysis, and (iii) collecting ancillary data and observations.

Stomach analysis. -- Thirty murrelets will be collected in the vicinity of trawl and hydroacoustic surveys being conducted by the forage fish study at Naked Island and Blackstone Bay (Fig. 1). Ten birds will be collected in May to coincide with the pre egg-laying phase, 10 birds will be collected in mid June to coincide with the incubation phase and 10 will be collected in mid July, the late chick-rearing phase. Past collection records will be examined to determine the best time of day to collect birds and avoid getting birds with empty stomachs. Birds will be collected by shotgun, weighed and measured and preserved for study skins and the stomachs and proventriculus preserved in 70% ethanol. Stomach contents will be identified under contract with University of Alaska biologists. We will compare stomach contents with results of trawl samples and hydroacoustic surveys. We will test for concordance between the species and density of fish identified by the fish surveys and the species and their frequency of occurrence in the murrelet's stomachs.

Blood lipid analysis. -- Lipid analysis techniques have been used successfully on marine mammals to determine diet composition (Iverson 1993), and we plan to investigate the technique for marine bird diets. This method uses fatty acids as trophodynamic tracers, which depending on the uniqueness of signature fatty acids in a species, can identify prey to phyla, class or species (Iverson 1993). At least 30 murrelets will be captured for blood samples in the vicinity of the primary study sites, or in areas frequented by radio-tagged murrelets. Birds will be captured using a floating mist net system used during the 1993 pilot study (Burns et al. 1994). We will also test the use of a lighter, more portable floating mist net system devised by Kaiser and Crawford (in review).

All captured murrelets will be weighed, measured for tarsi, culmen and wing length, and examined for plumage and brood patch condition. A blood sample will be taken from the patagial vein. Blood samples will not be taken from murrelets fitted with radio tags (see Objective 2, below) since the effects of such sampling on murrelets is unknown. Blood samples will be frozen for later

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analysis under contract.

Ancillary and complimentary diet information. -- Additional information on diet will be obtained ancillary to other components of this study. During netting and tagging of murrelets, it is possible to collect feces samples from the birds, which can later be examined for fish otoliths. Fecal samples may also be recovered in late summer from the fecal rings deposited by murrelet chicks, if nests are located. Because fish holding behavior occurs at sea, particularly during the chick rearing phase (Carter and Sealy 1987), observations of prey brought to the surface by murrelets will be recorded during the foraging observations of tagged murrelets or during other surveys at sea.

Objective 2: Foraging Behavior and Productivity

Foraging behavior. - We will determine the location of foraging areas and nest sites by radio tagging approximately 30 murrelets (15 at each study area) and tracking their movements over the course of a breeding season. The birds will be captured by floating mist nets between sunset and dawn, when nesting birds exchange incubation duties (see Burns et al. 1994). Murrelets will be captured at two locations - Naked Island and Blackstone Bay. Murrelets will be measured, checked for brood patch condition and a 2 g radio tag (good for 3 months) will be attached. Once the minimum number of murrelets is radiotagged using this proven method, we will experiment with other capture systems such as net guns (Quinlan and Hughes 1992) and small portable floating nets set on rafts (Kaiser and Crawford, in review) to increase efficiency and reduce costs in subsequent years.

Following release, radio-tagged murrelets will be located by fixed-wing aircraft fitted with telemetry tracking antennae (see Burns et al. 1994). Location of the birds on nests will be pinpointed from the air and recorded on marine charts and by GPS. Once located by air and with the support of teams operating from small boats and/or on foot, the inland location will be mapped to within 200 m of the nest. Once an inland site is located, it will be checked on alternate days for the tagged bird's presence inland and its foraging location at sea. Once chick rearing has commenced (determined by brief inland visits of the tagged bird, and no long daytime inland signals), the bird's location at sea will be tracked approximately every other day by plane.

The primary effort in 1994 will be to determine the foraging range and individual flight distances between a bird's nest and its foraging location. Secondarily, we will investigate the possibility of measuring the trip times of birds provisioning chicks. This will be done by stationing a boat or inland crew with a telemetry receiver in a position to monitor a nest for the arrival and departure of a tagged murrelet. The operating time for this monitoring effort would be between approximately 2200 - 1000 h, when most chick feeding occurs (Naslund, pers. comm.; Hamer, pers. comm.). The foraging trip distance of radio-tagged


murrelets will be compared between areas (Naked Island and Blackstone Bay) and breeding phases (pre and post hatching). Foraging trip times will be compared between areas during the chick rearing phase.

Productivity. -- Because murrelets are secretive, non-colonial and crepuscular birds, we cannot measure attendance or reproductive success directly. In 1994 we will work towards developing an index of reproductive success for marbled murrelets, so that we will eventually be able to test for differences in reproductive success among study areas and years.

We will obtain an index of reproductive success by censusing juveniles at-sea during the post-fledging period between late July and mid-August. The postbreeding movements of adult murrelets can cause local fluctuations in their numbers at sea (Carter 1984). Therefore, the juvenile survey data will be examined three ways: (i) the absolute number of juveniles in the study area recorded over three surveys between late July and mid August, (ii) the number of juveniles relative to the number of adults counted there in June (presumably the breeding population), as recorded during surveys by the forage fish study, and (iii) the ratio of juveniles to adults on the water during at-sea surveys between late July and mid August. Early molting adults can be confused with juveniles, but recent studies have examined plumage, size and behavioral features of juveniles, and training can minimize identification errors (Ralph et al. unpubl. ms, S. Miller, pers. comm.).

Objective 3: Characterization of Foraging Habitat

We will use three approaches to characterize murrelet foraging habitats in PWS: (i) following tagged birds to foraging sites to pinpoint the location and obtain information on the physical and oceanographic characterization of the site, (ii) obtaining information on relative prey abundance by directing forage fish surveys to important areas used consistently by tagged murrelets and to areas not used by them, and (iii) integrating observations of murrelets and oceanographic and trawl data collected by observers on forage fish and SEA research vessels. Periodic hydroacoustic surveys of the waters adjacent to the two nesting areas will be made during the chick rearing phase by the forage fish study. This will provide information on the relative abundance and distribution of fish in the two primary study areas.

Characteristics of Foraging Sites Used by Tagged Birds -- After each aerial survey, a two person team will be dispatched to a selection of the tagged birds which have previously been recorded inland (indicating nesting). The boat-based team will be equipped with telemetry equipment for locating the target birds on their forage grounds. The boat team will re-locate the tagged murrelet and will attempt to make visual contact (although this is not critical). The activity of the tagged bird will be monitored by telemetry for up to an hour, or until the bird leaves the area. The dive times and length of the foraging bout will be determined by changes in the radio signal (Burns et al. 1994).

Wherever a radio-tagged murrelet is located on the water and is observed to be feeding, the boat team will measure surface salinity, temperature, turbidity, current direction and speed and sonar recordings of water depth and bottom type. The presence of kelp, other seabird feeding activity and weather and sea conditions will also be noted. The location of the site will be pinpointed using GPS.

Site locations will be transferred to a GIS data layer in Anchorage. The current GIS layer includes shoreline type and bathymetry, but will eventually incorporate physical oceanographic data and forage fish distribution provided by the fish surveys. We will measure distance to underwater shelf break and distance to the nest using the GIS. We will use discriminant analysis to determine which factors best explain the presence of the tagged murrelets.

Focused forage fish surveys. -- We will direct the forage fish survey vessel to sites identified as frequent or important foraging grounds by tagged murrelets. Areas used by several tagged murrelets repeatedly will be surveyed by hydroacoustic and trawl samples. An adjacent area not used by the tagged birds will also be sampled to enable us to make a paired comparison.

Integration with other surveys. -- The SEA and forage fish surveys will be recording the presence of all seabirds, including marbled murrelets, which will compliment the data on tagged birds. We will determine if the results obtained by the tagged murrelets is in agreement with the trends observed in the general seabird surveys conducted from the SEAS and forage fish research vessels. In this way, we will be able to compare the choice of marine habitats of tagged birds, pre and post chick hatching, to those of the general population.

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5. Location:

The two proposed study sites are the Naked Island group in central PWS, and Blackstone Bay (Fig. 1). The radio-tracking effort may extend throughout PWS, depending on the movements of tagged murrelets. Our boats will operate out of the town of Whittier, where we will rent dock space and purchase some supplies and services. The telemetry tracking will operate out of Cordova, where we will purchase flight time for radio tracking and arrange for lodging in the PWS Science Center bunkhouse.

6. Technical Support:

We will require technical support of the GIS working group (USFWS), to provide coverage of the marine zone in PWS and to assist with mapping and marine habitat data analysis. The blood lipid analysis for diet composition will be coordinated with NOAA. Our study will need to integrate data on forage fish and oceanographic conditions obtained by Projects 94163 and 94320 this year and over subsequent years.

7. Contracts:

 <u>Vessel contracts</u> - We will contract, by competitive bid, a barge to transport camp equipment and supplies, including fuel, to the Naked Island study site. This camp will be coordinated with the pigeon guillemot study (94317) to use the same barge deliveries.

A large vessel (approximately 65 ft) will be contracted as a base of operations for the netting and radio-tagging operations, and as a mobile base camp for periods of operation in Blackstone Bay and at other temporary field camps. This vessel must have a large work deck, large boom and winch to properly support the setting and dismantling of the floating net system. This vessel may also provide a temporary base and supply runs for the pigeon guillemot study.

- b. <u>Radio telemetry</u> The majority of the radio telemetry part of this study will be contracted under a sole source contract to Rick Burns and Lynn Prestash, a professional team with prior experience in capture and radio telemetry techniques for marbled murrelets in British Columbia and Alaska. We will require a sole source contract because: (i) murrelets are difficult to capture and radio tag, (2) very few people have the necessary experience to capture, handle and track murrelets to nest sites, and (3) the success of the study depends on efficient and safe capture, radio tagging and tracking of murrelets. Burns and Prestash were the contractors that conducted the pilot study on radio tagging murrelets in PWS in 1993 (Burns et al. 1994) and developed this technique under contract with the Canadian Wildlife Service (Prestash et al. 1992, Burns et al. 1993)
- c. <u>Diet analysis</u> We will contract with the University of Alaska, Fairbanks, Institute of Marine Science (IMS), for identification of prey items found in the murrelet stomachs. IMS will identify prey and determine frequency of occurrence and relative volume of prey items for each bird. We will also solicit a competitive bid to contract for analysis of the blood lipid samples of captured murrelets.

SCHEDULES

D.

1. Milestone Dates

1994 March - April

Complete study plan, obtain vessel and service contracts, hire personnel, begin personnel training, purchase equipment and radio-tags.

<u>May</u> Safety training for field personnel, training for murrelet surveys, purchase camp supplies, set up Naked Island camp, begin netting and tagging efforts.

June - July Radio-tag murrelets and follow throughout breeding season, collect diet information.

August At-sea surveys for juveniles, collect diet information and complete tracking of radio-tagged murrelets. In late August, break down camp and store equipment.

<u>Sept - Oct</u> Data entry and analysis. Compiled and reduced data from capture and radio-tracking effort and diet analysis due from contractors. Receive forage fish and oceanographic data from Project 94163.

<u>Nov - Dec</u> Data analysis and report writing, archiving of samples and data.

1995 Jan 15 Draft report submitted to Oil Spill Coordinator.

<u>Feb 15</u> Draft report submitted for peer review.

March 30

Final report to Chief Scientist.

2. Project Personnel

Dave Irons:

Project Manager, responsible for overall management of project, supervises logistics and integration of projects and reviews reports.

Kathy Kuletz

Project Leader, will coordinate activities and data exchange with other projects. Responsible for study design, contract management, data analysis and completion of final products. Will supervise field operations from field locations (at beginning of each segment of project) and Anchorage office. Dennis Marks Assistant Project Leader and field supervisor. During the field season will be responsible for planning, data collection and logistics in the field. Post season duties include data compilation, analysis and report writing.

Nancy Naslund Biologist and training supervisor. Responsible for data compilation, will assist with field coordination and conduct training. Will remain in office when training is completed, to assist the Project Leader with the completion of analysis and writing.

Bio Tech Positions (4)

Assist in field preparations and remain in field. Will conduct surveys, assist in capture and collection operations, radio-track murrelets. After the field season, will assist with data entry and equipment maintenance.

3. Logistics

A field camp will be established at Naked Island, in conjunction with the pigeon guillemot study. A smaller field camp may be established in Blackstone Bay, to conduct at sea and inland surveys there. Temporary field camps, using small vessels and tents, may be established as needed to monitor movements of radio-tagged murrelets.

A large charter vessel is needed to support the capture and radio-tagging of murrelets. It will also serve as living quarters and transportation during that portion of the study. The same vessel will serve the Naked Island and Blackstone Bay study sites. A 25 ft. whaler and a 14 ft. zodiac will be required to conduct surveys, track radio-tagged murrelets to their forage sites, conduct on-site oceanographic measurements and attempt capture of murrelets with small net systems.

A small floatplane equipped with radio-telemetry tracking antennae and receivers will be required for tracking radio-tagged murrelets.

E. EXISTING AGENCY PROGRAM

There is currently no existing program within the USFWS or NMFS to monitor forage fish or murrelet foraging requirements in PWS, but there are programs to monitor seabird populations. The Division of Migratory Bird Management of USFWS is the lead agency for population surveys of marine birds in PWS, funded through Trustee Council funds, and monitors reproduction of black-legged kittiwakes with base funds. With approval of the forage fish studies in PWS, Project 94320 will be collecting data on forage fish (\$600 K) and the USFWS will be collecting concurrent data on occurrence of all seabirds (\$50K). The SEA study (Project 94163) will also provide data on juvenile herring and salmon in PWS. All of these data will be integrated with the marbled murrelet study.

F. ENVIRONMENTAL COMPLIANCE/PERMIT/COORDINATION STATUS

The inland and at-sea surveys will rely on observations only and are non-intrusive. 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. A limited number of birds will be captured and blood samples taken for lipid analysis. Additional birds will be sacrificed to obtain stomach samples. As a scientific study, the USFWS has determined that this study is on the list of categorical exclusions, in accordance with CEQ regulation 40 CFR 1508.4 of NEPA requirements.

The operation of a temporary field camp on Naked Island will require coordination with and a special use permit from the U.S. Forest Service, as these lands are within the Chugach National Forest. Coordination with the USFS will need to be completed prior to mid May.

G. PERFORMANCE MONITORING

In the event that the Project Leader, Kathy Kuletz, leaves before the project's completion, D. Irons will be acting project leader and N. Naslund will take on same office, analysis and writing responsibilities until a new project leader can be selected. Dennis Marks will remain in the field to supervise survey efforts for the remainder of the season. In the event that Nancy Naslund or Dennis Marks leave before the project's completion, replacements will be hired on an ASAP basis. Quality control will be assured by using experienced personnel, who are instructors themselves or have conducted murrelet surveys at least one season. Data sheets will be field-checked by the field supervisor, entered at the USFWS Anchorage office, checked against the raw data and corrected.

Personnel will be trained to distinguish between adult and juvenile marbled murrelets using photographs, study skins and training sessions in the field. Training sessions will also be given for conducting at-sea surveys and the identification of fish (held by murrelets on the water) using spotting scopes. Personnel involved in the capture and radio-tagging effort will be in continuous contact with the principal investigator to monitor methods, success rate and advise on plans. All data will be entered into a computer database and archived at USFWS. Reports will be submitted to the Oil Spill Coordinator, USFWS, for internal review, followed by the Trustee Council peer review process.

H. COORDINATION OF INTEGRATED RESEARCH EFFORT

The murrelet project will be coordinated with the forage fish study (94320) and the SEA study (94163), as described in the methods section of this report. Lead agency for Project 94320, the National Oceanographic and Atmospheric Administration, will be responsible for management of the fish and oceanographic data and the murrelet project (94102) will integrate the processed fish and oceanographic data with the murrelet data. Project study areas, the campsite on Naked Island and vessel support will be shared and coordinated with the pigeon guillemot study (94173). The guillemot study will also provide information on prey species availability via the chick feeding observations made at study colonies. A USFWS funded black-legged kittiwake project will provide additional information to test the food limitation hypothesis.

I. PUBLIC PROCESS

This project has been reviewed by the *Exxon Valdez* Oil Spill (EVOS) Public Advisory Group, the EVOS Trustee Council and has been published for public review. The final study proposal (this document) will be available for public and peer review.

J. PERSONNEL QUALIFICATIONS

1. Project Manager: Dave Irons

David Irons received his Ph. D. from the U. of CA, Irvine in 1992. His dissertation was on the foraging ecology and breeding biology of the black-legged kittiwake. The field work for this study was conducted in Prince William Sound. Irons received his M. S. from Oregon State University in 1982 where he studied foraging behavior of glaucous-winged gulls in relation to the presence of sea otters. Irons conducted marine bird and sea otter surveys in PWS in 1984 and 1985. He has been studying kittiwakes in PWS for 11 years and completed the EVOS kittiwake damage assessment study. Irons has overseen several seabird studies in the past few years including a marine bird and sea otter survey in PWS and in Cook Inlet, a seabird monitoring study on Little Diomede Island, and a cost of reproduction study on kittiwakes. Irons has authored and co-authored several reports and publications on seabirds and has made several presentations at scientific conferences.

Selected Seabird Publications:

Irons, D.B. Submitted to Auk. Size and productivity of black-legged kittiwake colonies in Prince William Sound, Alaska before and after the T/V Exxon Valdez oil spill.

____. In preparation. Foraging site fidelity and tidal rhythms in individual

Black-legged Kittiwakes.

In preparation. Flexible foraging behavior in seabirds: short-term buffer and long-term tradeoff?

. In preparation. The role of food availability in sibling aggression and brood reduction of the Black-legged Kittiwake.

- Hatch, S.A., G.V. Byrd, D.B. Irons, and G.L. Hunt. 1993. Status and ecology of kittiwakes in the North Pacific Ocean. Pages 140-153 in editors, K. Vermeer, K.T. Briggs, K.H. Morgan, D. Siegel-Causey, The status, ecology, and conservation of marine birds of the North Pacific. Can. Wildl. Serv. Spec. Publ., Ottawa, Canada.
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Vermeer, K., and D.B. Irons. 1991. The Glaucous-winged Gull on the Pacific Coast of North America. Acta Twentieth Congressus Internationalis Ornithologici:2378-2383.

2. Project Leader: Kathy Kuletz

Kathy Kuletz received her B.S degree in biology from The California Polytechnic State University, San Luis Obispo, and her M.S. degree in Ecology and Evolutionary Biology from the University of California, Irvine, in 1974 and 1983, respectively. Her thesis, based on research done at Naked Island, PWS, was on foraging and reproductive success of pigeon guillemots (*Cepphus columba*). Ms. Kuletz has worked in Alaska since 1976 for Dames and Moore Consulting, LGL Alaska Research and the U.S. Fish and Wildlife Service. In 1988 she conducted an independent study on at-sea censusing of murrelets for the Alaska Maritime National Wildlife Refuge. Since 1989, Ms. Kuletz has been P.I. for the marbled murrelet damage assessment study and the restoration studies for marbled murrelets. She was also co-author of the Pigeon Guillemot damage assessment study. For over 15 years she has managed study design, data collection, analysis and reporting of seabird populations,

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foraging and productivity. She has been active in the development of the Pacific Seabird Group protocols for murrelet surveys.

Selected Seabird Publications

- Kuletz, K. J. 1983. Mechanisms and consequences of foraging behavior in a population of breeding pigeon guillemots. M.S. thesis, University of California, Irvine. 79pp.
 - _____. In review. Marbled murrelet abundance and breeding activity at Naked Island, Prince William Sound, and Kachemak Bay, Alaska, before and after the *Exxon Valdez* Oil Spill. <u>In</u> Rice, J. and B. Wright [eds]. Proceedings of the *Exxon Valdez* Oil Spill Symposium, 1993. Amer. Fish. Soc.
- Kuletz, K. J., D. K. Marks, N. L. Naslund, and M. B. Cody. In review. Marbled murrelet activity in four forest types at Naked Island, Prince William Sound, Alaska. <u>In</u> S.G. Sealy and S.K. Nelson [eds], Proceedings of the Pacific Seabird Group Marbled Murrelet Symposium, 1993. Northwestern Naturalist.
- Naslund, N. L., K. J. Kuletz, M. B. Cody, and D. K. Marks. In review. Tree and habitat characteristics at fourteen marbled murrelet tree nests in Alaska. <u>In</u> S.G. Sealy and S.K. Nelson [eds], Proceedings of the Pacific Seabird Group Marbled Murrelet Symposium, 1993. Northwestern Naturalist.
- Oakley, K. L. and K.J. Kuletz. In review. Population, reproduction and foraging ecology of pigeon guillemots at Naked Island, Prince William Sound, Alaska, before and after the *Exxon Valdez* Oil Spill. <u>In</u> Rice, J. and B. Wright [eds], Proceedings of the *Exxon Valdez* Oil Spill Symposium, 1993. Amer. Fish. Soc.

2. Assistant Project Leader. Dennis Marks

Dennis Marks completed his B.S. degree in biology at the University of California, Irvine, and his M.S. degree in biology at the University of Oregon Institute of Marine Biology in 1979 and 1986, respectively. His M.S. research was on the feeding ecology of several species of bottom fish. In 1990 he participated in the marbled murrelet and pigeon guillemot damage assessment studies. In 1991 he coordinated various field logistics of the marbled murrelet restoration study. In 1992 he supervised the PWS boat survey studies and performed analysis and report writing duties. Previous to these studies, Mr. Marks spent several years coordinating field projects on the west coast and South America.

Selected Seabird Publications

- Kuletz, K. J., D. K. Marks, N. L. Naslund, and M. B. Cody. in review.
 Marbled murrelet activity in four forest types at Naked Island,
 Prince William Sound, Alaska. <u>In</u> S.G. Sealy and S.K. Nelson
 [eds], Proceedings of the Pacific Seabird Group Marbled Murrelet
 Symposium, 1993. Northwestern Naturalist.
- Marks, D. K., and N. L. Naslund. in press. Sharp-shinned hawk preys on a marbled murrelet nesting in old-growth forest. Wilson Bull.
 - _____, K.J. Kuletz and J.L. Naslund. In review. Marbled murrelet surveys in Prince William Sound, Alaska: surveying for marbled murrelet nesting habitat in remote areas. <u>In</u> Sealy, S.G. and S.K. Nelson [eds], Proceedings of the Pacific Seabird Group marbled murrelet symposium, 1993. Northwestern Naturalist.
- Naslund, N. L., K. J. Kuletz, M. B. Cody, and D. K. Marks. in review. Tree and habitat characteristics at fourteen marbled murrelet tree nests in Alaska. <u>In</u> S.G. Sealy and S.K. Nelson [eds], Proceedings of the Pacific Seabird Group Marbled Murrelet Symposium, 1993. Northwestern Naturalist.

Supervisory Biologist: Nancy Naslund

2.

Nancy Naslund received her B.A. degree in biology in and her M.S. degree in marine biology from the University of California, Santa Cruz, in 1985 and 1993, respectively. Ms. Naslund's M.S. thesis research was on the breeding biology of marbled murrelets and their seasonal use of inland nesting areas in central coastal California. In addition, Ms. Naslund has conducted field work since 1980 on a variety of terrestrial and marine bird species. Ms. Naslund was part of the 1991 team and supervised the 1992 team for the marbled murrelet restoration feasibility study, and performed analysis and report writing duties. Ms. Naslund is the Chair for the Pacific Seabird Group Marbled Murrelet Technical Committee.

Selected Seabird Publications

Kuletz, K. J., D. K. Marks, N. L. Naslund, and M. B. Cody. In review. Marbled murrelet activity in four forest types at Naked Island, Prince William Sound, Alaska. <u>In</u> S.G. Sealy and S.K. Nelson [eds], Proceedings of the Pacific Seabird Group Marbled Murrelet Symposium, 1993. Northwestern Naturalist.



- Marks, D. K., and N. L. Naslund. in press. Sharp-shinned hawk preys on a marbled murrelet nesting in old-growth forest. Wilson Bull.
- Naslund, N.L. 1993. Breeding biology and seasonal activity patterns of Marbled Murrelets (*Brachyramphus marmoratus*) nesting in oldgrowth forest. M.Sc. Thesis, Univ. Calif., Santa Cruz, California.
- _____. In press. Ecological and conservation implications of attendance by marbled murrelets at old-growth forest nesting areas during the non-breeding season. Auk.
- _____, K. J. Kuletz, M. B. Cody, and D. K. Marks. In review. Tree and habitat characteristics at fourteen marbled murrelet tree nests in Alaska. In S.G. Sealy and S.K. Nelson [eds], Proceedings of the Pacific Seabird Group Marbled Murrelet Symposium, 1993. Northwestern Naturalist.
- Singer, S. W., N. L. Naslund, S. A. Singer, and C. J. Ralph. 1991. Discovery and observations of two tree nests of the marbled murrelet. Condor 93:330-339.

K. BUDGET

See attached budget sheets.



EXXON VALDEZ TRUSTEE COUNCIL 1994 Federal Fiscal Year Project Budget October 1, 1993 - September 30, 1994

Project Description: Murrelet Prey and Foraging Habitat in PWS - Boat surveys for juveniles and edults and inland dawn watches at existing monitoring stations will be conducted to monitor the recovery of marbled murrelets throughout the oil spill area.

Budget Category:	1993 Project No.	'93 Report/ '94 Interim*	Remaining Cost**	Total FFY 94	FEY OF	Comment	
			***	5 5 5 GFT		www.sescent	
Personnel	\$0.0	\$0.0	\$119.3	110.3\$1.19:3	55.0040.0	FFY 95 costs are to write the report for	
Travel	\$0.0	\$0.0	\$4.0	\$4,0	\$0.0	field work conducted in FFY 94.	
Contractual	\$0.0	\$0.0	\$71.8	80.8 \$71.8	\$0.0		
Commodities	\$0.0	\$0,0	\$10.3	\$10.3	\$0.0		
Equipment	\$0.0	\$0.0	\$8.0	\$8.0	\$0.0		
Capital Outlay	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0		
Subtotal	\$0.0	\$0.0	\$213.4	\$213.4	55.0848:0		
General Administration	\$0.0	\$0,0	\$18.1	\$18.1	\$7.3		
Project Total	\$0.0	\$0.0	\$231.5	\$231.5	62.3 \$55.2		
Full-time Equivalents (FTE)	0.0	0.0	2.5	2.5	1.0		
	Dollar an	nounts are sh	own in thous	ands of dollar	5.	5	
udget Year Proposed Personne		Reprt/Intrm	Reprt/Intrm	Remaining	Remaining		
Position Description		Months	Cost	Months	Cost		
Project Leader		0.0	\$0.0	8.0	\$31 5		
Project Manager		0.0	\$0.0	2.0.0-0-0	90.420		
Program Manager		0.0	\$0.0	10	48.0		
2 Wildlife Biologists		0.0	\$0.0	1014.0	7704520		
Project Biotechnicians		0.0	\$0.0	80	\$24.0		
Expeditor		0.0	\$0.0	10	42 P	NEDA Conti	
			······································		¥2.0	NCFA CUSI: 90,0	
	Personnel Total	0.0	\$0.0	30.0.32.5	,\$419.9	**Feb 1, 1993 - Jan 31, 1994	
P14/93				****	4.9		
	Proje	ct Number:	94102		¥110.3	FORM 2A	
1994 Page 1 c	f 3 Proje	ct Title: M	urrelet Prey	/ & agin	PWS		
1 9/9/93 1	1:26 PM	Agency: Dept. of Interior, Fister Wildlife Service DETAIL					

EXXON VALDEZ TRUSTEE COUNCIL 1994 Federal Fiscal Year Project Budget October 1, 1993 - September 30, 1994

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			Reprt/Intrm	Remaining
avei:				
Includ	les travel to and from Prince William	Sound and Kuchemok-Bay via car, trein, plane,		
81	nd boat, and per diem at camp rate		60.0	en 7
B	T to Whittier with boat and trailer		\$0.0	\$0.3
3	RT to Whittler for 5 people		\$0.0	\$2.0
4	float plane trips to site		\$0.0	\$0.6
C	amp per diem (4 people x 50 days x	\$3/day)	\$0.0	\$0.4
2	RT to Cordova			
		Trough Tate	1 40.0	\$4.0
mtractu	81:	•		
15/000	haves for storess and maintanance	nf near (Feb 94 - Sent 94)	\$0.0	8.0.43.0
totia	shouse for storage and maniforance	urgen hen og - ocht og	\$0.0	\$0.8
Outh	userd winterization	·	\$0.0	\$0.6
What	ler winterization		\$0.0	\$0.6
Eme	rgency engine repairs	000	\$0.0	0.8 40.4
Vess	el charter for capture effort and traci	king (30 days @ \$4,000/day)	\$0.0	24.\$20.0
Radi	otelemetry contract for capture and t	agging Pro	\$0.0	\$18.0
Alre	aft charter for radiotelemetry tracking	g (16 days @ (50 0/day)	\$0.0	13.6-48.0
Geog	graphical Information System service:	9	\$0.0	8.0 \$10.9
SAS	annual fee		\$0.0	\$0.2
End-	user support system		\$0.0	\$0.2
Lip	ord Analysis		0.0	\$ 6.0
	· · ·	Contractuel Tote	1 \$0.0	80.8471.8
4/93	·			**************************************
		Project Number: 94102		ORM 2B
	Page 2 of 3	Project Title: Murrelet Prev & Foraging Habitat in PWS		PROJECT
1994	+	Annaus Dant of Interior Clab 9, Mildlife Ornelas		t that has been by the
		Adamatication and the second second		1.

EXXON VALDEZ TRUSTEE COUNCIL 1994 Federal Fiscal Year Project Budget October 1, 1993 - September 30, 1994

2.8

Commodities:	Reprt/Intrm	Remaining
Repair parts for Whaler (windshield wipers, fuel filters, gaskets, chain, etc.) Fuel - 75 gallons/day x 30 days x \$2/gallon + \$200 for oil Camp supplies - 6 people x 50 days x \$8/day Film, cassette tapes, water proof paper Camping fuel Water purifying filters, bear spray, bug repellant, first ald kits Replace climbing ropes and gear End-of-season cleaning/maintenance parts Batteries Mist nets end buoys for cepture system Quettro Pro upgrade	\$0.0 \$0.0 \$0.0 \$0.0 \$0.0 \$0.0 \$0.0 \$0.0	\$0.5 \$4.7 \$2.4 \$0.4 \$0.1 \$0.2 \$0.3 \$0.3 \$0.3 \$0.3 \$0.2 \$1.0 \$0.2
Commodities Totel	\$0.0	\$10.3
Equipment:		
Radiotelemetry transmitters Hydroacoustic sonar	\$0.0 \$0.0	\$5.0 \$3.0
,		
Equipment Total	\$0.0	\$8.0
14/93 1994 Page 3 of 3 Project Number: 94102 Project Title: Murrelet Prey Craging Habitat in PWS Agency: Dept. of Interior, File Wildlife Service	F	OF 2B FREECT DETAIL

94110

DETAILED PROJECT DESCRIPTION IS NOT APPLICABLE FOR THIS PROJECT

BRIEF PROJECT DESCRIPTION FOLLOWS

XXON VALDEZ OIL SPILL PROJECT DESCRIPTION

Title: Habitat Protection - Data Acquisition & Support

Project Number: 94110

Lead Agency: ADNR

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

Cost of Project, FY94: \$678.6K Cost of Project, FY95: \$144.5K

Project Startup Date: October 1993 Duration: 1 year

Geographic Area: Prince William Sound, Gulf of Alaska

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 these resources and services supported by them while recovery is taking place.

In 1993 the Restoration Team's Habitat Protection Work Group (HPWG) conducted a survey and assessment of selected parcels of private land within the oil spill zone. The lands were scored, 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. The evaluation was done using a variety of available data and information gathered from various agencies and technical experts, data collected during The Nature Conservancy's workshop, Natural Resource Damage Assessment reports, and field visits.

PROJECT DESCRIPTION

This project will provide the logistical and technical support necessary for the Technical Analysis Subgroup of the Habitat Protection Work Group to survey, identify and assess the upland and nearshore habitats of the nineteen, linked resources and services injured by the oil spill. The chief goals of this 1994 project would be to fill in data gaps, complete field surveys and evaluations, design projects and map evaluation units. Existing information, newly acquired survey data and evaluation results would be integrated and mapped using GIS, data management and project/document tracking databases. The initial product will be a comprehensive, evaluation document that contains analyses of all large parcels of private lands (owned by willing participants) within the spill zone and recommendations for habitat

protection on these lands. The documents will contain prioritized restoration units mapped in color.

Another aspect of this project would involve site inspections to evaluate the efficacy of various options that arise during negotiations. These site visits, which would occur subsequent to the first rounds of negotiations, may be required to ensure that the proposed protection options adequately meet stated restoration objectives. Site inspections would necessarily be conducted when the option is less than acquisition of full title, e.g., a conservation easement that allows the landowner to retain development rights that might adversely impact injured resources or services.

The element of the Comprehensive Process that concentrates on the larger parcels will be completed by late Fall of 1993. There are, however, advantages to protection of multiple, small areas. Once this first round of evaluations is complete and submitted to the Trustee Council, a *small parcel paradigm* will be developed and used for the evaluation and ranking of small parcels. The development of this evaluation system and its implementation will take place during the remainder of 1994. The product of this evaluation will be a comprehensive, evaluation document that contains analyses of all small parcels of private lands greater than 160 acres (owned by willing participants) within the spill zone and recommendations for habitat protection on these lands. The documents will contain prioritized restoration units mapped in color.

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.

Baid 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 private parcels (ADFG, ADNR, USFS, FWS).
- Design and test of small parcel evaluation paradigm/method (ADFG, ADNR, USFS, FWS).
- Data collection, interpretation, sorting, management, programming, and mapping (ADNR & ADFG).
- 4. Site reconnaissance on Kodiak Island, Afognak Island, Alaska Peninsula, Kenai Peninsula and PWS (ADFG, ADNR, USFS, FWS).
- 5. Site inspections and evaluation of protection options (project specific) (ADFG, ADNR, USFS, FWS).
- Development of comprehensive analysis document for Trustee Council review (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.

The Habitat Protection Work Group Technical Analysis Subgroup has a need to catalog and manage all the documents that have been amassed to date. They also will acquire all documents listed within the Nature Conservancy (TNC) workshop manuals as well as reports from the scientific literature. This will be done using OSPIC expertise and staff. 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 by the Habitat Protection Work Group Technical Subgroup using standard evaluation formats developed by this subgroup. Travel will be done via air and boat charters to be determined on a sitespecific basis.

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

D. Location

The analysis will cover all selected 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 OSPIC to catalog and manage documents required by this project and acquire documents related to this project.

Alaska Department of Fish and Game and 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

Field surveys and assessments will be scheduled as a function of:

- 1. Review of 1993 surveys and evaluations,
- 2. Results of on-going and future negotiations with landowners, and
- 3. Addition of lands from landowners who have agreed to participate in the program.

An initial comprehensive evaluation report on selected parcels will be provided to the Trustee Council in December 1993. Design and test of small parcel evaluation methodology will be completed in Winter 1993-1994. Survey and evaluation of small parcels will be completed during summer 1994.

EXISTING AGENCY PROGRAM

During FY94, the federal and state agencies involved in this project will contribute to this 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

- Computer databases easily accessible with resource information for lands within the spill zone.
- Cataloged and organized library containing all resource documents required by this project.
- 3. Site survey reports for all available lands within the spill zone.
- 4. Video and color photographs of surveyed units.
- 5. Color maps depicting restoration units and surrounding lands.
- 6. Comprehensive analysis documents for all available lands within the spill zone.

FY94 BUDGET (\$K)

	ADNR	ADEC	ADF&G	USFS	FWS	TOTAL
Personnel	87.6	0.0	51.9	9.8	27.2	176.5
Travel	17.2	0.0	17.2	8.6	8.6	51.6
Contractual	330.0	12.0	34.5	4.5	3.0	84.0
Commodities	4.6	0.0	6.5	0.5	0.5	2.1
Equipment	1.0	0.0	0.0	0.0	0.0	1.0
Capital Outlay	0.0	0.0	<u>0.0</u>	0.0	<u>0.0</u>	<u>0.0</u>
Subtotal	440.4	12.0	110,1	23.4	39.3	625.2
General Administration	36.2	0.8	10.2	1.8	4.3	53.4
Project Total	476.6	12.8	120.3	25.2	43.6	678.6
NEPA Compliance	0.0					

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DETAILED PROJECT DESCRIPTION IS NOT APPLICABLE FOR THIS PROJECT

BRIEF PROJECT DESCRIPTION FOLLOWS

94126

 EXXON VALDEZ OIL SPILL PROJECT DESCRIPTION

 Intel:
 Habitat Protection and Acquisition Fund

 Project Number:
 94126

 Lead Agency:
 ADNR

 Cooperating Agencies:
 USFS, DOI-FWS, DOI-NPS

 Cost of Project, FY94:
 \$1,032.1K

 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 lace.

In 1993 the Restoration Team's 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.

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.

Project Description

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. 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 Protection Work Group Technical Analysis Subgroup using standard evaluation formats developed by this subgroup. 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)

The allocation of Joint Trust Funds to this project is presented below.

	ADNR	USFS	USFWS	TOTAL
Personnel	17.1	30.0	126.6	173.7
Travel	12.8	33.0	27.7	73.5
Contractual	249.0	400.0	20.0	669.0
Commodities	0.0	0.0	0.5	0.5
Equipment	0.0	0.0	50.0	50.0
Capital Outlay	TBD*	TBD*	TBD*	TBD*
Subtotal	278.9	463.0	224.8	966.7
General Administration	20.0	25.0	20.4	65,4
Project Total	298.9	488.0	245.2	1,032.1
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.